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FOREIGN LICENSING -- U.S. GOVERNMENT AGENCIES

BY
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PRESENTED TO
INTERNATIONAL PATENT LICENSING CONFERENCE
OCTOBER 9, 1969

It is indeed a pleasure to participate in this International Patent Licensing Conference which is being conducted concurrently with the first annual PATEXPO. In keeping with the newness of this conference and exposition, I would start by mentioning some other firsts. The foreign patent program of the National Aeronautics and Space Administration, which I shall discuss in some detail with you this morning, is a relatively recent innovation within Government, and is perhaps the first attempt of a government agency to commercially exploit its patented technology in the overseas market place. And, as a direct result of this program, the first exclusive license under a government-owned foreign patent was executed earlier this year. This was a true original from two viewpoints -- the grant of exclusive manufacturing rights in a United States government-owned patent to a foreign corporation, and the receipt of income by the Government in consideration for

the grant of patent license rights. Before passing, and to give proper and deserved credit, the Atomic Energy Commission was the first government agency to establish an organized foreign patent program some years ago, and was of great assistance to NASA in initiating its program. I understand that a discussion of the unique licensing program of the AEC and its applicability to private industry is scheduled for tomorrow morning's conference session.

In accepting a speaking engagement of this type to address representatives of the private sector concerning the involvement of federal agencies in international patent licensing, I must confess that I approached it with some apprehension. However, I do believe that the Government, and especially NASA, has a timely contribution to make to the overall foreign patent picture and, accordingly, I will speak to you on this topic not from the viewpoint of an old-line, experienced government agency, but rather, from the viewpoint of a still youthful, innovative agency. I will explain some of the problems uncovered in establishing a new program, what we have learned through our brief experience, and the worth-while goals which we expect to accomplish. While the title

of my topic, as you can observe from the program, broadly includes all government agencies, my comments will be generally restricted to the NASA program since, as I have indicated, the Atomic Energy Commission and NASA are the only two agencies presently active in the foreign patent area, and the AEC program will be covered on tomorrow's agenda.

The NASA foreign patent program is quite similar in purpose and design to a program which would be established by a corporation or business in private industry. The problems are comparable in securing adequate patent protection on selected valuable inventions in elected foreign countries, in attracting prospective licensees, in the negotiation of the license agreement, and in the administration and enforcement of a valid patent license beneficial to both parties. The foreign patent licensing field is one which presents a challenge to the organization and to the individual, whether he be legal counsel, technical representative, or a sales or marketing specialist, each of whom is essential to the team effort involved. A key member usually missing from the government team is the marketing specialist or the old-fashioned

traveling salesman, and this, at times, is an insurmountable barrier, as I will discuss later.

Initially, the question may be legitimately asked as to why a government agency would initiate a foreign patent program. What is the proper role of an agency in exploiting government-owned inventions and patents? In answer, I would state positively that the intention of the foreign patent program is not to compete with private industry. In fact, as far as NASA is concerned, we are normally desirous of deferring to our many contractors when they indicate their desire to file foreign patent applications and to exploit the foreign rights on inventions which are made and reported under contract. We consider the allocation of rights in inventions in the foreign area quite differently from the allocation of domestic rights in inventions, which is a separate subject in its own right and which is continually debated and studied. As many of you are aware, the existing cornerstone of federal patent policy is the Presidential Memorandum and Statement on Government Patent Policy issued by President Kennedy on October 10, 1963.

The premise on which our foreign patent program is based is that potentially valuable inventions, valuable both to the Government and to industry, reside within the approximately 20,000 invention disclosures and approximately 2,000 patents or patent applications comprising the ever-widening NASA portfolio -- and that such inventions, constituting a valuable national asset, will continue to lie dormant and unexploited in the world market place without an organized effort or program to acquire and utilize foreign patent rights.

In establishing a program of this type, it is essential to set initial objectives or goals. Further, to succeed in creating a meaningful and effective program, the established objectives must be recognized and accepted by the company or agency entity as part of its overall mission. A foreign patent program cannot exist without active support of management and other officials, outside of the patent department.

The objectives of such a program in private industry may be briefly summarized. There are fundamentally four: First, exclusive protection -- foreign patents are obtained to afford a high degree of protection for the company's business. This enables it to maintain exclusive lines of

products and services in countries where the company does or expects to do business.

The second objective is defensive -- to assure freedom of action to the maximum practical extent. The aim is to keep the company free to use its own best engineering developments and to trade patent rights for essential licenses needed from others.

Third, licensing for income -- companies may obtain patents in order to establish a patent portfolio useful in licensing other companies and thus provide royalty income. This policy is more frequently used for countries where the company does not have a business.

And, fourth, licensing with know-how. Sometimes a company will obtain patents to support a policy of helping other companies to establish businesses based on the know-how it has developed. The management of such a company may wish to limit itself to research and development of inventions and to the technical know-how to utilize such inventions in a commercial business, without engaging in the business itself. These mentioned objectives are set forth and elaborated upon in an article by John R. Shipman entitled "International Patent

Planning" in the Harvard Business Review of April 1967. I recommend this article to your attention.

In describing the objectives of the NASA program in terms of the above four fundamental objectives, I believe we most closely fall under the latter two. The first two, exclusivity and defensive protection, are ruled out by the character of the government agency. Like educational and non-profit institutions, sometimes referred to as the third sector, NASA does not make or sell the products and processes embodying their inventions for commercial purposes, and must license these inventions in order to exploit them. Licensing private concerns for royalty income under our foreign patents, and helping companies establish commercial markets based on the inventions and technical know-how that we have developed primarily for aerospace purposes, are our basic objectives.

In more formal terms, the objectives of the NASA program, briefly stated, are to further the interests of United States industry in foreign commerce, to enhance the economic interests of the United States, and to advance the international relationships of the United States.

Taking these one at a time, the first -- to further the interests of United States industry in foreign commerce -- is the objective that perhaps primarily concerns you for purposes of today's presentation. We would hope that the acquisition of foreign patent rights, followed up by an active licensing program, would enable you to introduce a new product in the foreign market place in the face of foreign competition, or, perhaps more realistically, would enable you to fit an analogous item into your existing commercial product line and thereby better your position in the market place. Should not private industry doing business in various regions throughout the world be interested in securing foreign license rights on NASA-developed inventions, which would fit in side by side with existing export market product lines?

I realize that I have stated our first objective is to further the interests of United States industry in foreign commerce. I would hasten to add that rights under our acquired foreign patents are available to either domestic or foreign concerns on a royalty-bearing basis or for other consideration. In fact, the first license that NASA granted was to a Japanese company, as I will discuss shortly. And, to be truthful, the

major interest in our program thus far has been expressed by foreign business concerns.

By our second objective, to enhance the economic interests of the United States, we have in mind a monetary return to the United States, which, even though minimal, would to some extent aid in the balance-of-payments situation, and which would make the program, if worthwhile, self-sustaining. In this regard, it has recently been stated that the total industry licensing income attributable to patent royalties and fees has resulted in more than a three-quarter billion dollar annual flow into the United States from abroad, which materially assists the overall economic objectives of the United States Government.

The initial impact upon you of the concept of paying patent royalties to the Government may be unfavorable and one of displeasure. However, it should be realized that the contemplated royalty payment would ultimately be derived from the foreign consumer and not the individual United States taxpayer or the licensee. The policy of licensing for income applies only to the foreign patent portfolio of NASA, and does not extend to its domestic licensing program.

The third stated objective is to advance the international relationships of the United States. We feel that there are inventions in our portfolio which could be utilized effectively in international programs, whether they be space-oriented, or whether they be programs such as those supported by the Agency for International Development or other government agencies. Perhaps, some of the NASA-generated new technology could find application in developing countries, and the incentives of the patent system could lead to its introduction.

In addition, NASA, under the provisions of its enabling statute, the National Aeronautics and Space Act of 1958, has been charged with the mission of providing for the widest practical and appropriate dissemination of information concerning its activities and the results thereof. The foreign patent program serves in fulfilling this dissemination of information mission through publication of patent disclosures abroad, while at the same time maintaining a proprietary string on valuable inventive subject matter going abroad.

Now, the three points I have just covered are speculative in nature. No hard prediction can be made as to whether these benefits will, in fact, materialize, but it was our feeling

that the time had come to test these theories either on a government-wide basis or within NASA in the form of a limited, trial program. I might add that NASA has never been timid in advancing novel programs or fresh concepts which are believed to be in the public interest, as evidenced by our leading role in the continuing debate centered around federal patent policy, and by the widely heralded NASA technology utilization program.

In this regard, one of the problems in justifying or evaluating a foreign program of this type is its long-range aspect. Many of the measurable benefits will not be known or arrived at for perhaps eight to ten years -- the time it may take to build a valuable patent portfolio, and for new and advanced technology to find utilization in the foreign market place. A foreign patent program must be initiated with this time-frame in mind to survive the impatience of short-range management.

Since NASA initiated its foreign patent licensing program slightly over three years ago through publication of formal regulations, there have been at least two bills circulated within Government which would establish a government-wide foreign patent program, having similar objectives, under the

sponsorship of the Department of Commerce. Other proposals which have not reached the definitive stage have suggested a quasi-Government corporation, perhaps fashioned after the British National Research and Development Corporation, for implementing such a program. Published figures evidence the fact that the total patent licensing income of NRDC exceeded three million dollars during the last year; United States licensees alone paid two million dollars. Historically, government-wide foreign patent programs are nothing new. President Truman, in 1947, signed Executive Order 9865 establishing a government-wide foreign patent program which subsequently failed in the early fifties because of lack of funding, licensing authority and interest, and which has never been revitalized.

Turning now to the implementation and management of a foreign patent licensing program, it is readily apparent that an organized group effort, utilizing the combined management, business, legal and marketing skills of those involved, is required. Implementation of a foreign patent program broadly consists of the following steps: establishing criteria for determining which technological developments should be

considered for the foreign filing of patent applications, and in which foreign countries the applications should be filed; the acquisition of the services of authorized patent representatives in the selected foreign countries necessary to effect the filing, prosecution, and maintenance of the applications; the attraction of prospective licensees through publications and other channels; and finally, the negotiation, execution, administration, and enforcement of the ensuing license agreements, the end objects of the entire program.

Each agency or company must establish its own criteria for selecting inventions upon which to file, based upon such factors as financial resources, fields of technology engaged in, extent of R&D programs, marketing outlets, product potential, and so forth. For those with established product lines such as communications equipment, ball bearings, or electrical components, the selection process may not be too difficult; however, in the case of a government agency which has no such product line, the criteria must necessarily be quite broad. In many instances, the inventions selected for filing by NASA are one-shot developments with little background

or related technology on which to rely. However, over a period of time, we have found some limited product lines beginning to develop. For example, NASA has developed a family of silicate-based paints originally adapted for space-craft use, and a series of fire retardant foams and paints, as well as the numerous inventions which stand alone. Our defined categories for selecting inventions for foreign filing are:

a. Inventions which may be utilized abroad in governmental programs of the United States -- a broad classification which, to some extent, overlaps and includes inventions covered in subsequent categories;

b. Inventions which may be exploited abroad in the public interest by license to U.S. nationals or others, i.e., those inventions we feel have considerable commercial promise;

c. Inventions which may be utilized in applications type satellite systems, such as the automatic read-out equipment associated with the meteorological satellites, or telemetry equipment employed

in ground stations tied in with communications satellite systems;

d. Inventions considered to be basic discoveries or of major significance in the art, even though their immediate utilization is not clear; and

e. Inventions in a field which directly concerns the public health or welfare, such as novel food products, new medical instruments and drugs.

Where do we file? We have thus far limited our filing to eleven foreign countries, eight of which are members of the European Space Research Organization (ESRO) and which obviously have an interest in space technology common to ours, plus Japan, Australia and Canada. We have attempted to limit our filing to those countries having strong patent systems and wherein the technology which has been derived from our space research and development programs would have the best opportunity of being utilized. Of course, in private industry, similar considerations are applicable. In what countries would a particular product be saleable, in what countries would a particular product be too complex or too costly for the general public, in what countries will the company's patents be

respected, and in what countries does the company have sales representatives or business outlets? All of these factors, and more, must be considered.

In order to file patent applications in foreign countries, the applicant's attorney or agent must be familiar with the individual law of the particular country and also must be registered to practice before the national Patent Office, just as attorneys must be registered before the United States Patent Office. In order to obtain the services of these foreign patent practitioners, and at the same time receive assistance in initiating our program, we originally negotiated contracts with two United States law firms who maintain associates in each of the foreign countries in which we have expressed an interest. The reason for utilizing the services of these firms is the limited amount of expertise available in-house to NASA or to any government agency in the foreign patent area, as is the case with most private concerns except for the very largest. Foreign patent practice is a very specialized area of patent law and is not generally engaged in by individual patent practitioners. Through the assistance

of our retained firms and our own efforts, we are building up our own degree of in-house expertise in this area.

Moving on to the actual objective of the foreign patent program, the licensing of the patents acquired -- the first step is that of attracting potential licensees or, in other words, advertising the available product. We have had little trouble in bringing our inventions available for licensing to the attention of interested domestic and foreign concerns. We were quite surprised at the number of trade journals that would pick up and print abstracts of our inventions on a gratuitous basis, and the number of inquiries which these publications prompted. During the last two years, we have received several hundred inquiries from foreign concerns regarding our portfolio of inventions. We have also published a pamphlet, "Significant NASA Inventions Available For Foreign Licensing," having a brief abstract and figure of the inventions, together with a copy of the NASA licensing regulations, which we send to interested parties.

While on the subject of attracting prospective licensees, I should mention that, in anticipation of placing a display of NASA patented new technology in PATEXPO '69, we have, for

the first time, drawn together selected examples of NASA hardware available for licensing, and have fashioned them into an integrated exhibit structure for viewing. This was also a very worthwhile project internally since, too often, Headquarters personnel, managers and cognizant attorneys are removed from the hardware itself and lose the proper prospective in administering a licensing program of this type.

Attracting inquiries, however, is only the first step. The major gap is between the attracting of the prospective licensee and the execution of the actual license agreement. Of the several hundred inquiries I have mentioned, only a relatively few have been heard from again after having received amplified technical information on certain inventions. This is, in large measure, due to our lack of a sales force, or marketing representatives, following up and knocking on the doors of parties making initial inquiries. Being a government agency, our staffing obviously does not provide for marketing or sales representatives, and it is quite unlikely that it ever will. Accordingly, we are forced to run a relatively passive program, relying almost wholly on correspondence, and to a great extent hope that the prospective

licensee will return to our door. This is obviously not the optimum manner in which to run an effective program. I am sure that those of you attempting to promote a foreign licensing program with limited resources are encountering similar problems.

Once a licensee materializes and the time has come to negotiate and prepare the formal legal instrument, the attorney comes to the forefront. In the agreement that I shall speak of shortly, twenty-five different articles were included having to do with such things as the duration of the agreement, scope of rights granted, the initial payment to be made by the licensee, minimum royalties and statement of rates, who may enforce the patent, designation of currency, applicable law, and on and on. We also found that we quite easily could have employed many more articles than those that were included.

Being a government agency, it was also necessary to include several articles which, unless you have dealt with the Government previously, would be quite confusing to anyone, as, I am sure, it is to a foreign licensee. I refer to such articles as "Covenant Against Contingent Fees" and "Officials Not to Benefit" clauses required by United States procurement

statutes. Perhaps the major difficulty in formalizing the license agreement itself is the arms-length, long distance negotiation which, at least in the initial stages, is compounded by language differences. To attempt to negotiate a license by mail is quite a task. To sit down around a table or desk with representatives of both sides present makes negotiation infinitely easier.

We have learned that in a program of this type there are many problems. It is not inexpensive to acquire foreign patents and the costs are continually rising. Perhaps the proposed and much discussed Patent Cooperation Treaty will help in this regard. Further, the administrative detail attributable to such a program is quite large. Very few organizations have the requisite skilled personnel to administer such a program in the same manner as their domestic programs. In addition, there is always a date-deadline factor in view of the time period set for response to official letters by the foreign patent offices and by the delays occasioned by language differences, the routing of papers through various individuals, and the distances involved.

While mentioning the fact that the time factor is of significance in a foreign patent program, it should also be brought out that the majority of the foreign patent laws differ from the United States patent law in at least one very major respect. Under the U.S. law, an applicant for letters patent is allowed a one-year period of grace subsequent to publication of his invention disclosure in a trade journal, magazine, or other printed publication to get his application on file in the U.S. Patent Office. However, under the majority of foreign patent laws, this same applicant is barred from obtaining a patent on his invention simultaneously with the date of the initial publication, unless the applicant has previously filed his patent application in one of the so-called "convention" countries. Obviously, with our widespread dissemination activities, such as the NASA Tech Brief Series and the STAR, "Scientific and Technical Aerospace Reports," we must win the race with them in the initial filing of patent applications in order to maintain our foreign patent rights on valuable inventions.

Perhaps the leading substantive problem, for a government agency at least, is that of enforceability of the patent and

the granting of a meaningful exclusivity to a licensee. It seems clear that it would require a very rare and unusual set of circumstances before the United States Government would elect to subject itself to the jurisdiction of a foreign court so as to sue infringers or to invoke its legal remedies under a patent. To partially offset this, we propose to authorize an exclusive licensee to enforce the patent at his own expense, and the license will so provide. I realize that there are probably as many different legal issues involved as to who may sue as there are national patent systems. However, I would hasten to add that, hopefully, in most cases, litigation would not be a prerequisite to recognition of our patents, just as it is often not required in the case of privately owned patents. We would rather rely on the technical information which we may contribute as a back-up package to our licensee, on possible trade-offs of rights in patented inventions or technical information, and on the ethical standards of the industry concerned.

Looking briefly at the first foreign license granted by NASA, the patented invention pertained to the interconnection of solar cells. The U.S. patent application was filed in

February of 1964 and recently issued in August of this year. The counterpart foreign applications were filed in January of 1965, within the one-year convention priority period. The licensee, Nippon Electric Company, Ltd., of Japan, originally learned of this invention through the list of abstracts which we have mailed out to many trade journals and to various industrial concerns throughout the world. The initial inquiry was received in April of 1967. Fortunately, the company retains an extremely capable attorney here in New York City to represent them, and after several drafts and a final meeting, the license was executed and made effective upon validation by the Japanese Government in January 1969, approximately 21 months after the initial inquiry. Sixty days prior to the license grant, notice was promulgated in the Federal Register providing interested parties an opportunity to comment or object. No adverse comments were received.

The license grants to Nippon the sole and exclusive right and license throughout Japan to manufacture the invention covered by the claims of the patent. In consideration therefor, the licensee has made a substantial down-payment and has agreed to a fixed royalty based on the fair market

value of all units used or sold throughout the agreement, which expires in 1981, unless sooner terminated. Nippon has also been granted the sole right to enforce the patent throughout Japan, and to institute litigation to restrain infringement, if necessary, at its own expense.

In conclusion, I would state that the foreign patent area is one of great challenge and of tremendous potential, both to private industry and to government agencies. The prospective monetary return to the company, the favorable effect on the balance-of-payments scale in a broad economic sense, and the opportunity for export expansion, all make this a potentially fruitful area. However, to reiterate, to be successful, a foreign patent program must be carefully organized with established objectives. The program must fit into the policy framework of the corporation or agency, and must have its recognized place; for, without adequate resources and proper direction, such a program can be quite costly, ineffective and wasteful. I will close by emphasizing the fact that the NASA program that I have been discussing must rely on the active participation of industry to be successful

in obtaining its stated objectives, and that we heartily solicit your interest and comments.

Thank you.

SIGNIFICANT NASA INVENTIONS

Available for Licensing in Foreign Countries

National Aeronautics and Space Administration

NASA FOREIGN PATENT LICENSING PROGRAM

The foreign licensing program of the National Aeronautics and Space Administration serves to promote and utilize foreign patent rights vested in the Administration. The objective of this program is to extend the patent coverage on valuable NASA-owned inventions to various foreign countries in order to further the interests of United States industry in foreign commerce, to enhance the economic interests of the United States, and to advance the international relationships of the United States.

Licenses will be individually negotiated and may be granted to any applicant, foreign or domestic, on a nonexclusive or exclusive basis for royalties or other considerations and on such other terms and conditions as are deemed appropriate to the interests of the United States. Preference in the granting of foreign license rights will be shown to those applicants who have previously been granted a license under the corresponding U.S. patent or patent application. The NASA Foreign Patent Licensing Regulations, 14 C.F.R. 1245.400 et seq., are reproduced on the following page.

This publication includes abstracts of those inventions in which NASA owns the principal or exclusive rights and which are presently available for patent licensing in the countries indicated. All inquiries, requests for additional information, and applications for license should be addressed to:

Assistant General Counsel for Patent Matters
National Aeronautics and Space Administration
Washington, D.C. 20546

Title 14—AERONAUTICS AND SPACE

Chapter V—National Aeronautics and Space Administration

PART 1245—PATENTS

Subpart 4—Foreign Patent Licensing Regulations

New Subpart 4 is added:

Subpart 4—Foreign Patent Licensing Regulations

Sec.
1245.400 Scope of subpart.
1245.401 Policy.
1245.402 Types of licenses and terms and conditions.
1245.403 Government license.
1245.404 Enforcement of patent rights.
1245.405 Procedures.

AUTHORITY: The provisions of this Subpart 4 issued under 42 U.S.C. 2457 (g) and (h).

§ 1245.400 Scope of subpart.

(a) The subpart establishes the policy, terms, conditions, and procedures under which NASA-owned foreign patents and patent applications may be licensed.

(b) The provisions of this subpart apply to all NASA-owned patents granted in countries other than the United States and to NASA-owned patent applications pending in such countries and supplement the provisions of Subpart 2 of this part for foreign patent licensing.

§ 1245.401 Policy.

The foreign licensing program of the National Aeronautics and Space Administration serves to promote and utilize foreign patent rights vested in the Administration. The objectives of this program are to further the interests of United States industry in foreign commerce, to enhance the economic interests of the United States, and to advance the international relationships of the United States.

§ 1245.402 Types of licenses and terms and conditions.

Licenses will be individually negotiated and may be granted to any applicant, foreign or domestic, on a nonexclusive or exclusive basis for royalties or other considerations and on such other terms and conditions as are deemed appropriate to the interests of the United States. Preference in the granting of foreign license rights will be shown to those applicants who have previously been granted a license under the corresponding U.S. patent or patent application.

§ 1245.403 Government license.

There will be reserved from each exclusive license an irrevocable, nonexclusive, nontransferable, royalty-free license for the practice of such invention throughout the world by or on behalf of the United States or any foreign government pursuant to any existing or future treaty or agreement with the United States.

§ 1245.404 Enforcement of patent rights.

An exclusive licensee will be authorized to enforce the licensed patent and to sue infringers of the patent at its own expense.

§ 1245.405 Procedures.

(a) NASA will publish in the United States, and elsewhere as may be appropriate, lists of NASA-owned foreign patents or patent applications available for licensing.

(b) NASA will also furnish written notice of the availability for licensing of NASA-owned foreign patents or patent applications to any licensee under the corresponding U.S. patent or patent application.

(c) Applications for license should be addressed to the Administrator, National Aeronautics and Space Administration, Washington, D.C. 20456. The application must fully identify the patent or patent application, and state the type of license requested together with proposed terms and conditions thereof.

(d) The conduct of negotiations with prospective licensees will be the responsibility of the General Counsel, NASA. In the conduct of such negotiations, due regard shall be had for the possible interests of NASA program and staff offices, and their coordination will be obtained as deemed appropriate.

(e) NASA will publish notice in the FEDERAL REGISTER, and elsewhere as may be appropriate, of its intention to grant an exclusive license under an identified patent or patent application. An exclusive license will not be granted until the expiration of 60 days from the date of notice in order to provide a suitable time interval for interested persons or other Government agencies to interpose comment or objection.

(f) All licenses shall become effective upon the written acceptance by the licensee of a license instrument specifying the type of license and terms and conditions thereof.

Effective date. The provisions of this Subpart 4 are effective upon publication in the FEDERAL REGISTER.

JAMES E. WEBB,
Administrator.

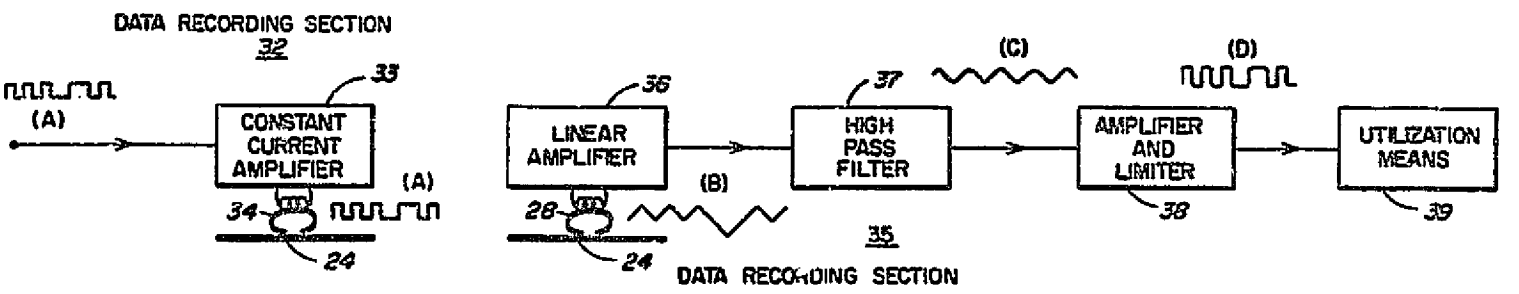
[F.R. Doc. 66-8920; Filed, Aug. 17, 1966; 8:45 a.m.]

Listed below are abstracts of various NASA-owned inventions which are available for foreign licensing in the identified countries in accordance with the NASA Foreign Patent Licensing Regulations, published on August 18, 1966, in 31 Federal Register 10958-10959. Inquiries and all requests for licenses should be directed to Assistant General Counsel for Patent Matters, Code GP, National Aeronautics and Space Administration, Washington, D.C. 20546.

SYSTEM FOR RECORDING AND REPRODUCING PULSE CODE MODULATED DATA

In pulse code modulated magnetic tape recording and reproducing (playback) systems, the playback head tends to alter the shape of the recorded signal. Accordingly, the reproducing system must reconstruct the proper signal from the altered one. This invention eliminates the need for this reconstruction function by the design of the playback head in which the head gap is approximately one-half the wave length of the recorded pulse code modulated data at its fundamental pulse repetition frequency. The playback head thus provides an output signal which is an integral of the recorded signal and contains all of the recorded information. The invention also allows a higher packing density of the recorded information on the magnetic tape.

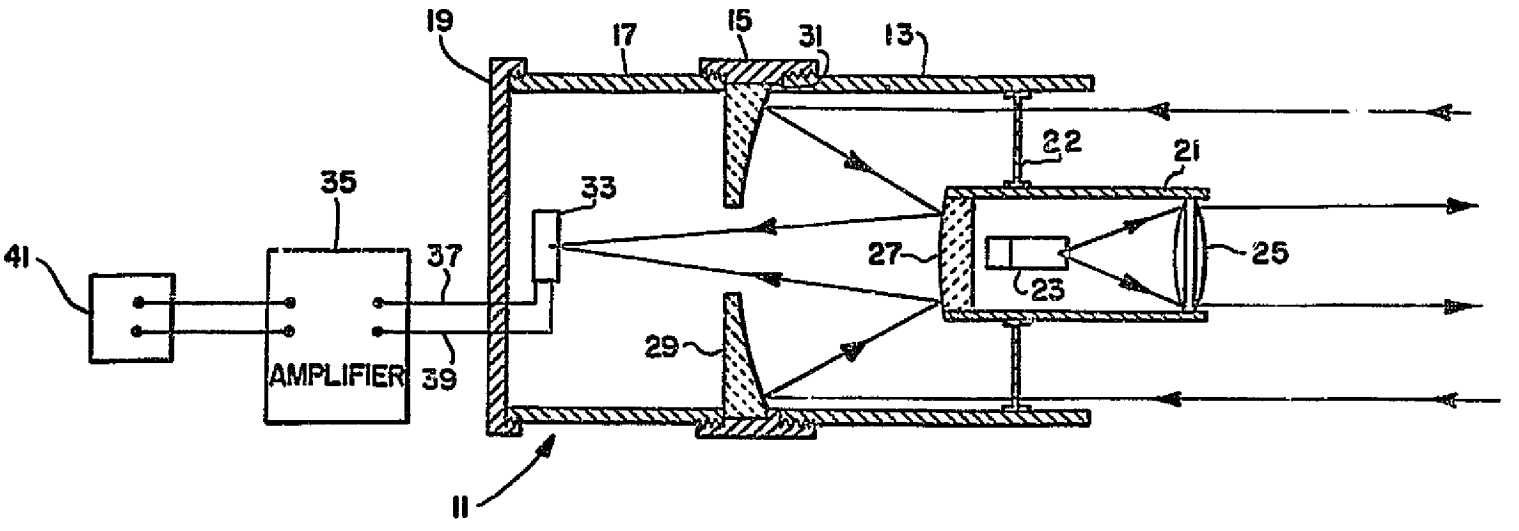
XGS-1021 Belgium, Canada, France, Sweden, United Kingdom, West Germany



OPTICAL COMMUNICATIONS DEVICE

This is a light beam communication system in which energy from sound waves created by speaking in close proximity to a passive modulator, a modified corner reflector, modulates a remotely projected light beam and returns the modulated light beam parallel to the incoming beam back to the source. The light beam modulation is decoded and amplified to produce a signal which can be used to drive a speaker, or the intelligence may be stored for future use.

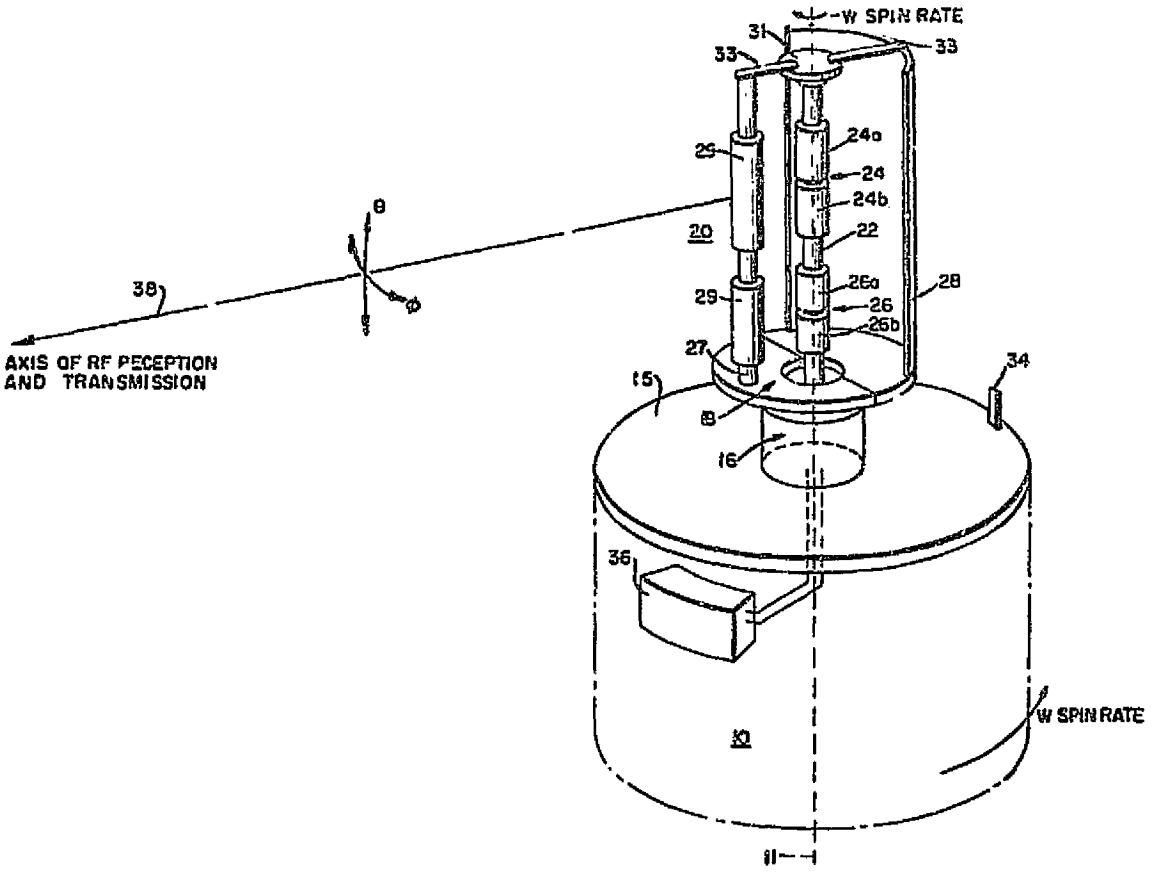
XLA-1090 Belgium, Canada, France, Sweden, United Kingdom, West Germany



APPARATUS PROVIDING A DIRECTIVE FIELD PATTERN AND ATTITUDE SENSING OF A SPIN-STABILIZED SATELLITE

A satellite, adapted to spin about an axis, having antenna elements for communicating with a remote body and a beam collimator rotatable with respect to the spin axis. The beam collimator is rotated at the same rate and in the opposite direction as the spin of the satellite to provide a directional beam stationary in space. Ejection apparatus enables the collimator to be jettisoned in event of rotational malfunction so that an omnidirectional beam may be provided about the spin axis. Signal processing circuitry operating in conjunction with the antenna elements provides information concerning the attitude of the satellite.

XGS-2607 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



FOAMED IN-PLACE CERAMIC REFRACTORY INSULATING MATERIAL

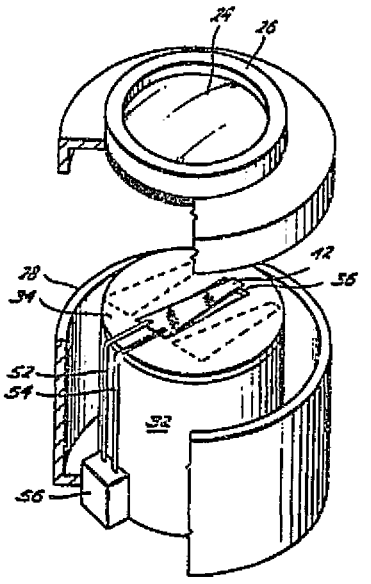
In many applications there is a need for providing vibration shielding and also thermal protection for electrical components. Most prior potting compositions, while providing mechanical vibration protection, do not exhibit satisfactory thermal characteristics. On the other hand, some prior art refractory materials are known to have excellent thermal properties; however, electrical components cannot be potted directly in them because the extremely high temperatures required in the curing portion of the potting process would damage or destroy the components. In such cases it was necessary to prepare refractory blocks of various shapes which were then fitted around the objects to be protected. The obvious disadvantages of this procedure are obviated by this invention which may be foamed in-place since its curing time and temperature are relatively low. The invention has other uses such as in furnaces and in the construction industry as a low-cost, easily workable insulating material.

XGS-2435 Canada

LIGHT DETECTION SYSTEM

A system for determining the position of a light source about two axes of a reference position. The system, originally developed for orienting antenna on the Mariner spacecraft, utilizes a single movable part, a vibrating reed shutter, for alternately blocking and passing light from the source projected onto a photosensitive detector at the position of reference.

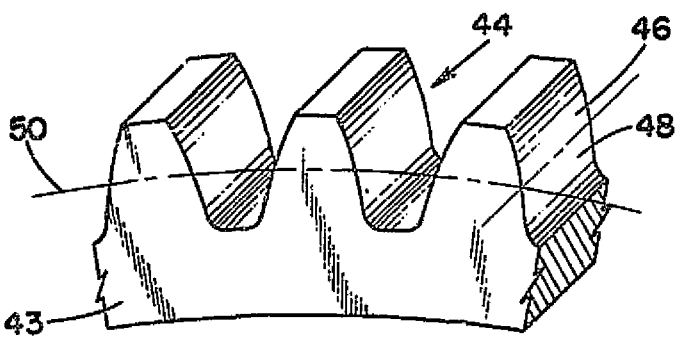
XMS-1059 Australia, Belgium, Canada, France, Italy, Japan, United Kingdom, West Germany



METHOD OF IMPROVING THE RELIABILITY OF A ROLLING ELEMENT SYSTEM

Current bearing manufacturing practice generally specifies that bearings shall have balls or rollers of hardness equal to the hardness of the races. This invention method greatly improves the load capacity and fatique life of roller element systems by controlling the relative hardnesses such that the hardness of the elements subjected to the greater number of stress cycles is less than that of the elements engaging them by an amount between one and two points as measured on the "Rockwell C" Scale.

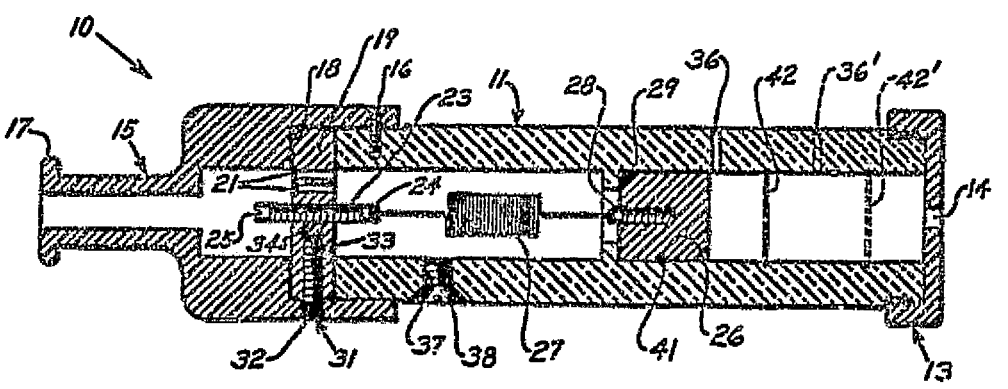
XLE-2999 Belgium, Canada, France, Japan, Sweden, United Kingdom, West Germany



INSTRUMENT FOR USE IN PERFORMING A CONTROLLED VALSALVA MANEUVER

One of the clinical tests in the evaluation of the cardiovascular system of a human being is the Flack test which requires the imposition of a known constant pressure (greater than atmospheric) within the lungs and thorax and then a sudden release of the overpressure. The changes in the pulse rate and blood pressure of the subject associated with this maneuver (called a Valsalva Maneuver) are used in the Flack test as indicators for evaluating the cardiac control mechanism. Known devices for performing this maneuver have the disadvantages of requiring a gravitational field for proper readings of a manometer, large size, and fragile construction. There also is a possibility that the subject will use cheek muscles rather than the thoracic muscles, rendering incorrect results. This invention is rugged and compact, requires use of the thoracic muscles, and is not dependent upon the presence of a gravitational field for operation.

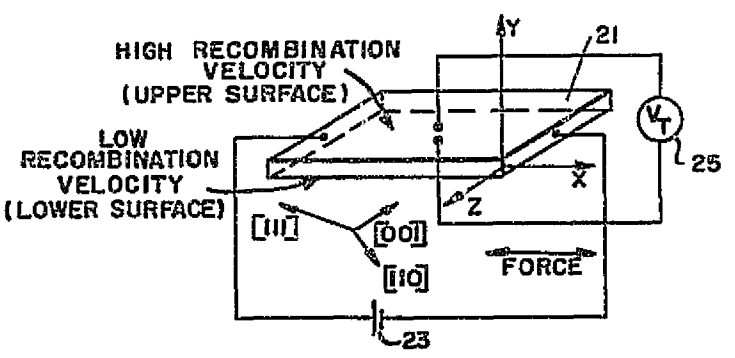
XMS-1615 Australia, Belgium, Canada, France, Holland, Italy, Japan, Switzerland, United Kingdom, West Germany



TRANSVERSE PIEZORESISTANCE AND PINCH EFFECT ELECTROMECHANICAL TRANSDUCERS

This invention is a replacement for strain gages and accelerometers. The device may be used in any environment where conventional piezoresistive or strain gage electromechanical transducers can be used. In addition to the foregoing uses, the device can be used in bioelectric sensing due to its small size. The transducer, of anisotropic piezoresistive material, includes a body of semiconductor material having a longitudinal force axis that is skewed with respect to the crystallographic orientation of the body. The material combines the pinch effect with the piezoresistive effect. The device produces a much larger electrical signal for a given stress than presently known in the prior art.

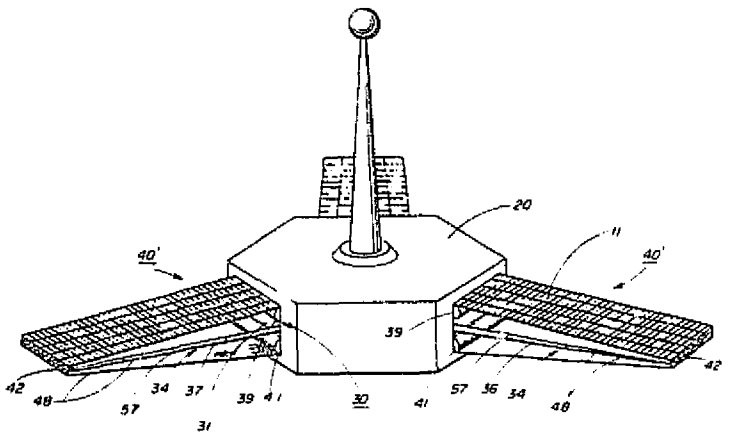
ERC-10088 Canada, France, Holland, Japan, United Kingdom, West Germany



INTERCONNECTION OF SOLAR CELLS

Expanded metal, that is, a thin metal strip which has first had short longitudinal cuts made therein and then been pulled transverse to the cuts to open the cuts into diamond shaped holes, has been used as interconnectors in a solar cell matrix to provide a flexible, somewhat resilient array. The solar cell array can be compactly stored prior to deployment and then deployed into a variety of shapes through the use of a new expandable frame in which telescoping tubes are extended to a desired length and then cemented to form a rigid support structure.

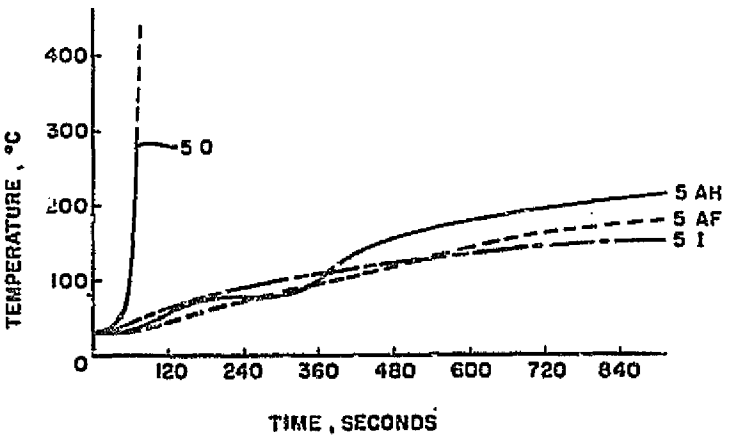
XGS-1475 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



FIRE RETARDANT FOAMS

Modified foams have been developed which provide effective protection for thermally sensitive structures against the destructive action of fuel-fires. The invention relates to the modification of closed cell rigid and semi-rigid polyurethane foams in the density range of from 0.50 to 50 pounds per cubic foot. The modifying agents include three types: a certain class of alkyl halide resins, a certain class of inorganic salts, and encapsulated halogen bearing volatile molecules. The modified foam may then be applied by conventional methods. Outstanding protection against fire has been achieved.

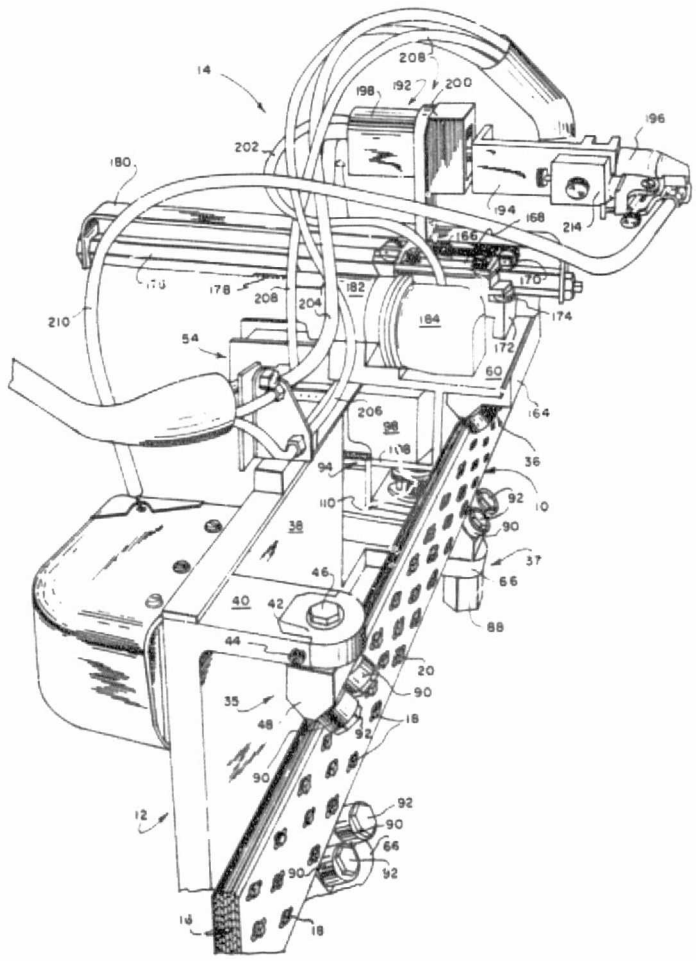
ARC-10098 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



WELDING SKATE AND TRACK

A track and skate combination is commonly used in the precision welding of relatively large articles such as tanks, ship hulls, etc. The track is contoured to the desired shape and placed alongside and parallel to the seam to be welded. This invention features a reusable track fabricated of a plurality of laminates that is easily bent into any desired shape and a skate having individually pivoted sets of wheels which can negotiate sharp curves on the track.

XMF-1542 Canada, France, Italy, Japan, United Kingdom, West Germany



POTASSIUM SILICATE-ZINC COATINGS

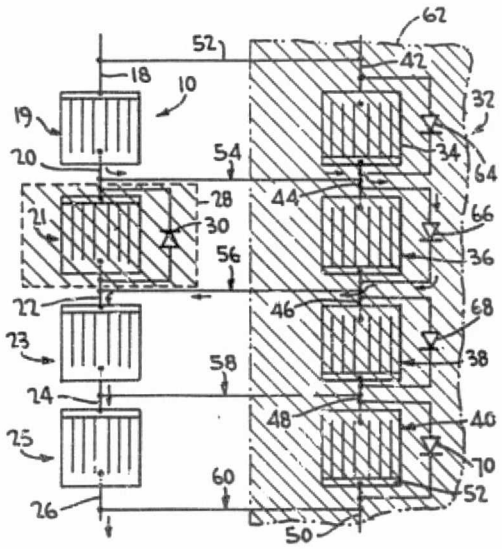
Zinc dust coatings which, when dried on a metal surface, are crack, craze, and abrasion resistant. The coatings are formed by combining a potassium silicate solution with zinc dust and, optionally, including an alkly trialkoxysilane. These compositions of basically inorganic materials are intended primarily for the protection of metals subject to adverse environmental conditions.

GSC-10361 Australia, Belgium, Canada, France, Holland, Italy, Japan, Switzerland, United Kingdom, West Germany

USE OF UNILLUMINATED SOLAR CELLS AS SHUNT DIODES FOR A SOLAR ARRAY

An improvement has been made in the electrical interconnection of solar cells in an array of solar batteries. Each individual cell of a shaded battery is electrically connected in parallel with a corresponding cell of an illuminated solar battery. The p-n junction solar cell of the shaded battery provides a forward biased diode equivalent in a by-pass conducting path around the corresponding illuminated cell in the event it becomes non-conductive. Thus, uninterrupted current flow is maintained in the event the illuminated cell fails to function.

GSC-10344 Canada, France, Holland, Italy, Japan, United Kingdom, West Germany



INTUMESCENT PAINTS

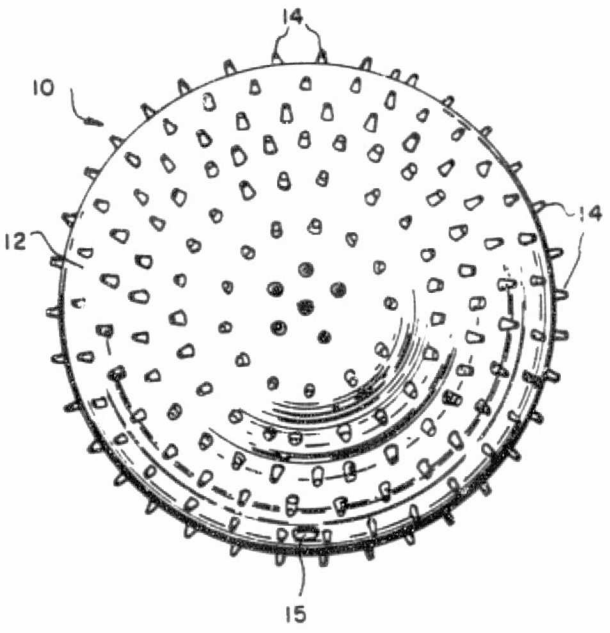
Intumescent (swelling or expanding) paints useful for fire protection have been produced. Conventional intumescent paints suffer from many disadvantages including sensitivity to water and other solvents, little resistance to scuffing and abrasion, sensitivity to thermal erosion by flames, and limited efficiency in the protection of substrates under thin steel plate or sheet. This paint overcomes these disadvantages and provides outstanding protection. The intumescent material is an aromatic nitroamino compound in the form of its sulfate, either dissolved or dispersed in a vehicle, or prepolymerized, or both. Upon heating, such a paint intumesces, chars and provides a flame resistant coating.

ARC-10099 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany

FLUID FLOW SENSOR

A meteorological balloon having superior response and aerodynamic stability characteristics due to provision of a plurality of evenly dispersed protuberances on the balloon surface. These protuberances form a roughened surface to provide a more evenly distributed flow separation area to induce a larger balloon wake, resulting in greater stability in flight.

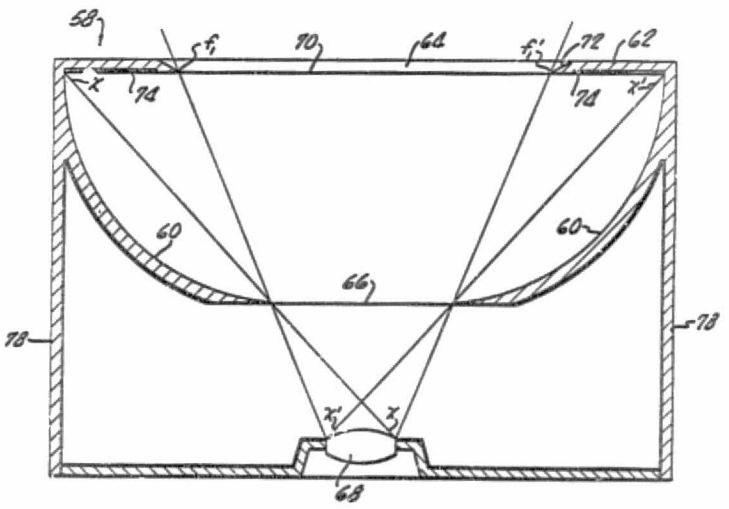
XMF-4163 Canada



ANTI-GLARE IMPROVEMENT FOR OPTICAL IMAGING SYSTEMS

This invention is directed to an anti-glare baffle for shading rays such as light rays or other radiant energy rays which emanate from outside a desired field of view. The device may find use in sensitive still and movie cameras, light meters, telescopes, radiometers, photometers, electro-optical position sensors, photocell shades, star tracking devices and the like. The anti-glare baffle has a specularly reflective surface formed from an oblate hemispheroid. A shading flange extends inwardly from the upper edge of the hemispheroid and intersects the foci of the oblate hemispheroid. The oblate hemispheroid and flange surround a viewing aperture and spaced ray detecting device.

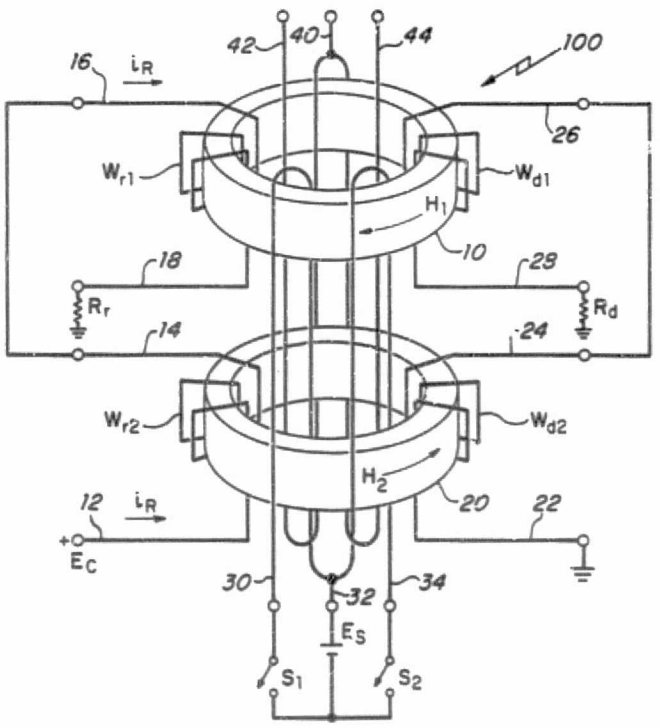
NPO-10337 Belgium, Canada, France, Great Britain, Italy, Japan, West Germany



UNSATURATING SATURABLE CORE TRANSFORMER

The transformer of the present invention will not saturate at any time under any conditions for any length of time. The device includes a pair of stacked, uncut, saturable magnetic cores having a plurality of windings. The cores operate in parallel and provide a means of detecting, warning and suppressing any impending saturation before saturation can occur. Many advantages are gained from the use of this transformer such as: elimination of the main apparent cause of power transistor failure in inverter circuits while enabling existing power transistors to process double or more load current, and, enabling a better utilization of existing components because it reduces the need to derate switching components to a small fraction of their current carrying capacity.

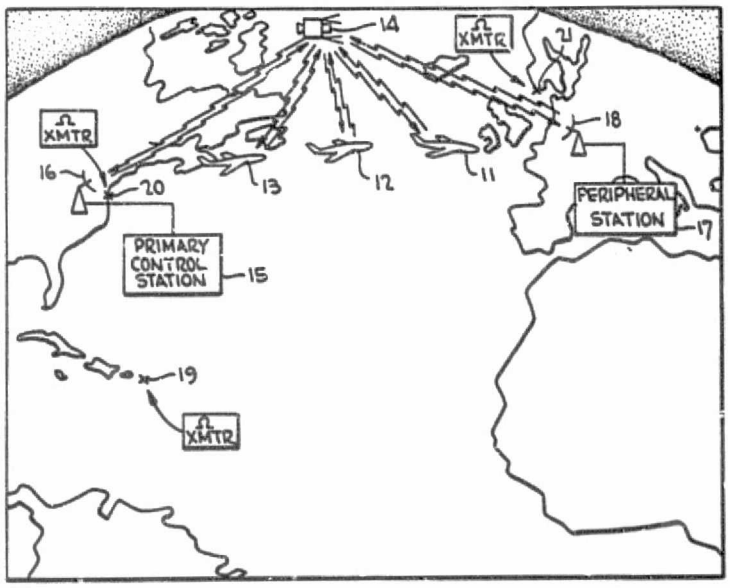
ERC-10125 Canada, France, Holland, Italy, Japan, United Kingdom, West Germany



POSITION LOCATION SYSTEM AND METHOD

System and method for position locating, deriving centralized air traffic control data, and communicating via voice and digital signals between a multiplicity of remote aircraft (including supersonic transports) and a central station, as well as a peripheral ground station(s), through a synchronous satellite relay station. Side tone ranging patterns, as well as digital and voice signals are modulated on a carrier transmitted from the central station and received on all of the supersonic transports. Each aircraft communicates with the ground stations via a different frequency multiplexed spectrum. Supersonic transport position is derived from a computer at the central station and supplied to a local air traffic controller. Position is determined in response to variable phase information imposed on the side tones at the aircraft, and relayed back to the transports. Common to all of the side tone techniques is Doppler compensation for the supersonic transport velocity.

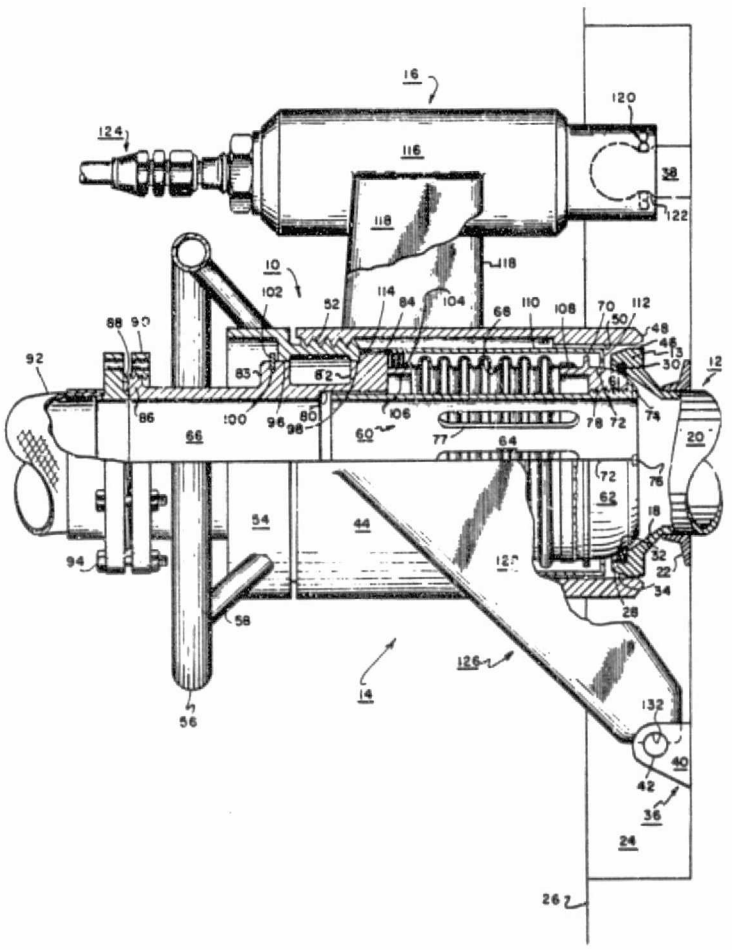
GSC-10087-1 Australia, Belgium, Canada, France, Italy, Japan, Switzerland, United Kingdom, West Germany



FLUID COUPLING ASSEMBLY

A quick attach and release fluid coupling for use in those instances where it is desirable that the coupling not only be free from leaks, but also be both easily assembled together and separated. The mating conical and spherical sealing surfaces of this coupling serve to eliminate alignment problems. The coupling is ideally suited for use in cryogenic piping systems where icing conditions are encountered.

XKS-1985 Belgium, Canada, France, Italy, United Kingdom, West Germany



FIRE RESISTANT COATING COMPOSITION

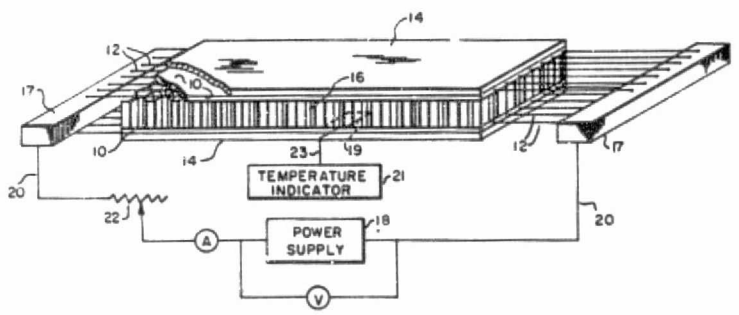
Fire resistant coating compositions intended for high temperature applications, which when dried are flake, crack, craze, and abrasion resistant and of greatly reduced leachability. The compositions, which are combinable with selected conventional pigments and fillers, comprise a combination of a potassium silicate solution, ceric oxide, and/or alkyl trialkoxy silane as rehydration suppressants, and wollastonite as a film builder.

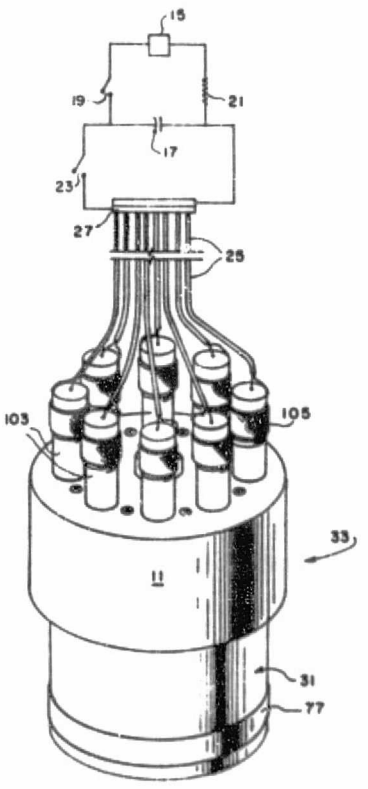
GSC-10072 Australia, Belgium, Canada, France, Holland, Italy, Japan, Switzerland, United Kingdom, West Germany

HEAT CURING OF THERMOSETTING PLASTIC FILM ADHESIVES

In order to manufacture strong lightweight metal panels for use in very large structures such as bulkheads in propellant tanks for spacecraft boosters or large aircraft, it is desirable to utilize a honeycomb structure. The difficulty experienced is in curing the thermosetting film which is used as the adhesive to bond the outer plates to the honeycomb core. It was impractical to place the panel in a curing oven since such an oven would have to be very large and it would not be satisfactory for other differently shaped panels. This invention provides curing of the thermosetting film by incorporating a heat producing means within the bonding material.

XMF-1402 France, Canada, Italy, United Kingdom, West Germany

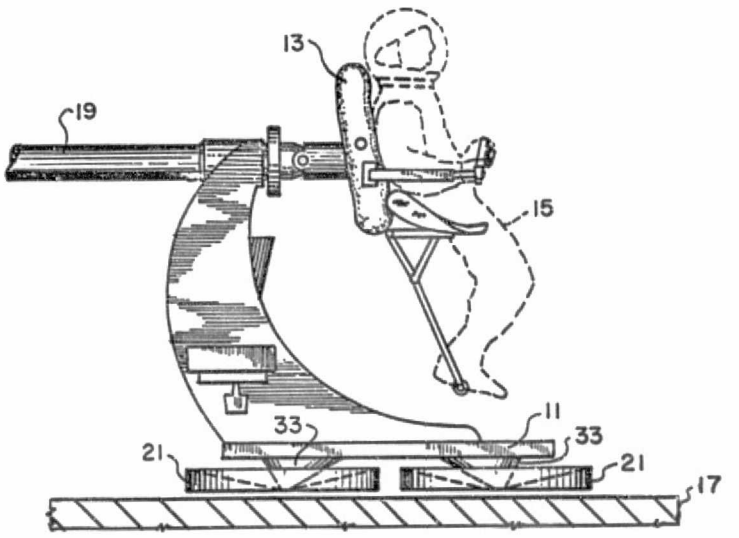




AIR CUSHION LIFT PAD

An air cushion lift pad has been developed which utilizes an air cushion of pressurized air to support a device above a surface. The pad includes an upper wall which slopes upwardly from a center portion. Should the pad tend to tilt, the vertical lift force component acting on the inner wall will tend to decrease on the high side and increase on the low side, thereby producing a torque tending to stabilize the pad along the horizontal. A plurality of pads may be used and the design achieves a very stable device with no flutter, vibration, heaving or pitching.

MFS-14685 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



MAGNETOMOTIVE METAL WORKING DEVICE

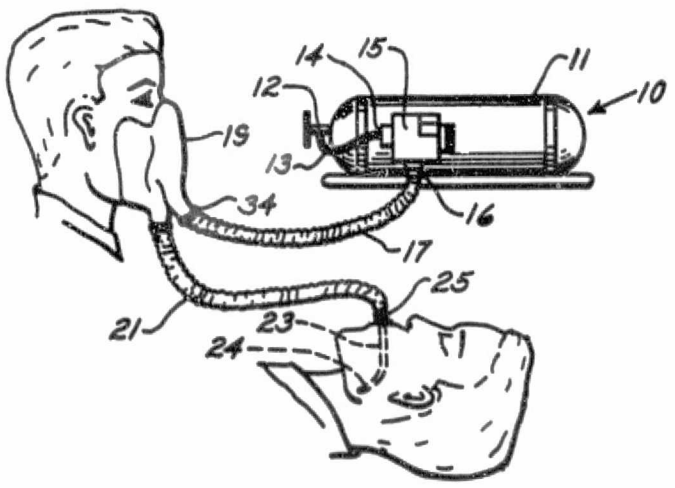
A portable magnetic hammer, a metal working device developed in the course of the Saturn program, wherein energy for manipulating a metal workpiece is acquired by creating a high-intensity magnetic field from a controlled electrical discharge into a conductor coil. This compact, lightweight device performs sizing, blanking, and stress removal functions without surface marring of the metals.

XMF-3793 Belgium, Canada, France, Holland, Italy, Japan, Sweden, United Kingdom, West Germany

RESUSCITATION METHOD AND APPARATUS

A more direct method has been developed to revive a person suffering from respiratory failure or arrest. By means of an airway or tube inserted into the throat, oxygen is delivered directly to the lungs of the patient. The increased intrapulmonic pressure induces ready assimilation of oxygen into the vascular system and employment of a tube or airway precludes pharyngeal blockage and the possibility of the subject's swallowing his tongue.

XMS-1115 Canada, France, Holland, Italy, Japan, Switzerland, United Kingdom, West Germany



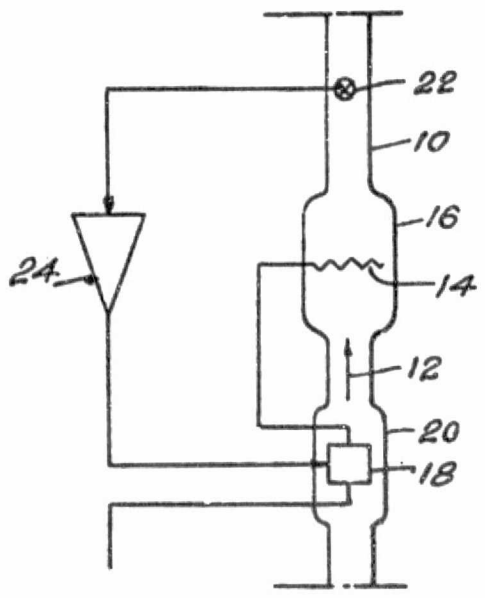
TIME DIVISION MULTIPLEX SYSTEM

Apparatus for synchronizing a satellite time division multiplex system so that signals can be transmitted or received between any of the stations. The system constantly compensates for Doppler shift so that a medium altitude satellite is always in synchronization.

APPARATUS FOR CONTROLLABLY HEATING FLUID

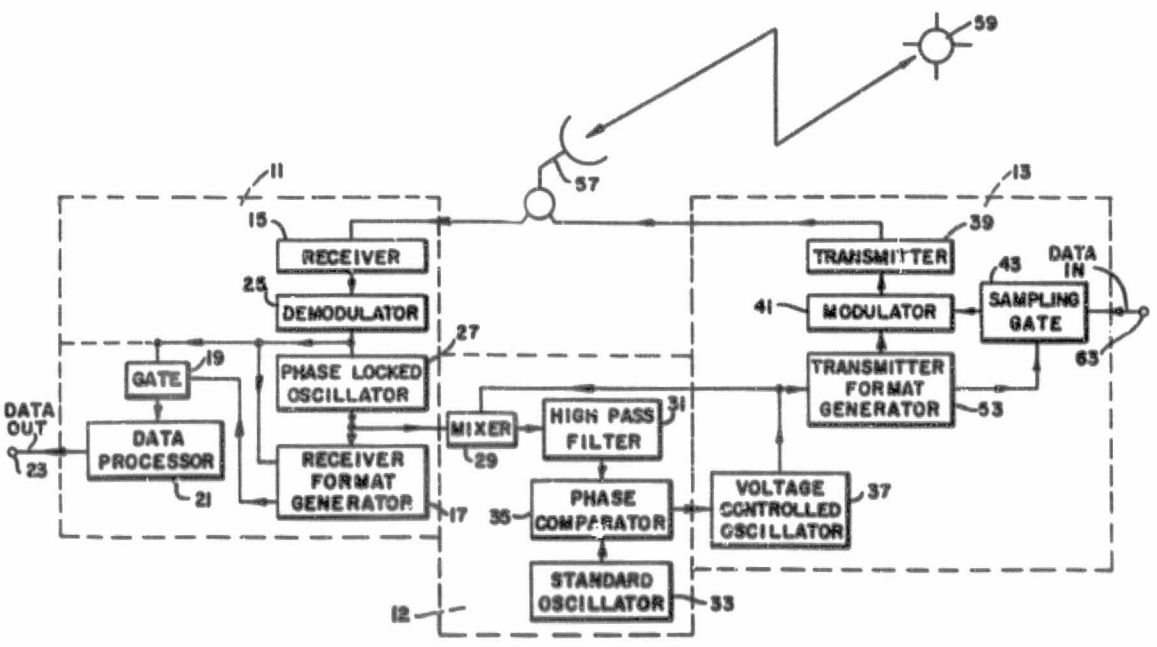
This invention is associated with fluid heating devices which operate by circulating fluid past an electronically controlled heater element in a flow conduit. The efficiency of such devices is increased by placing the heater control components in the conduit, upstream from the heater element, thereby utilizing the heat generated in the control components for preheating the fluid anterior to the principal heater element.

XMF-4237 Canada



Additionally, a system is provided for centering a slave station in an empty slot in the time division multiplex format.

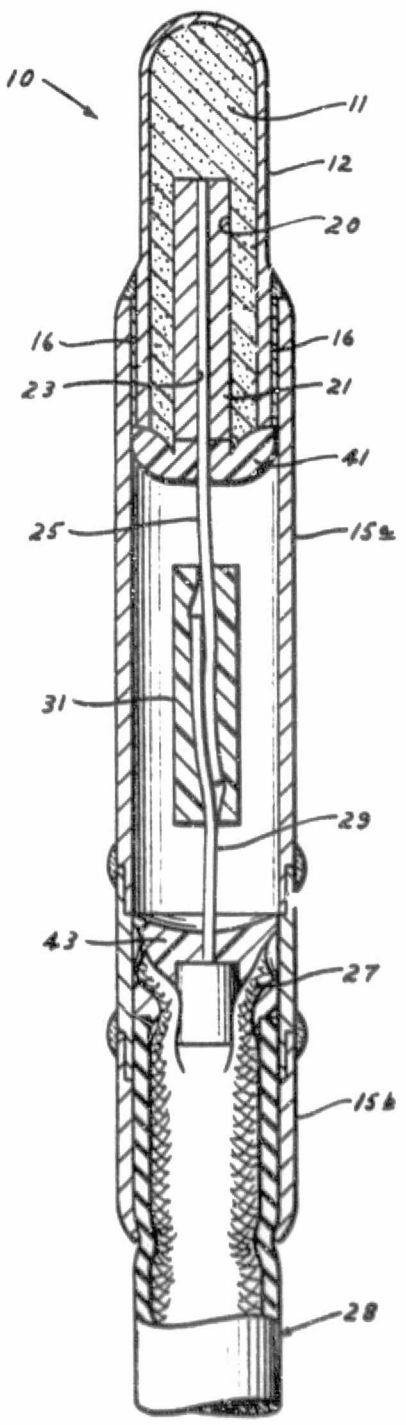
XGS-5918 Australia, Belgium, Canada, France, Holland, Italy, Japan, Switzerland, United Kingdom, West Germany



MEDICAL DETECTING PROBE

A radiation detector in the form of a bullet has been developed for easy insertion into the human body tissue to indicate radiation damage to body cells or to measure dose levels of radioactive tracers. The detecting element is formed from a silicon crystal having a P-N type junction. When a reverse bias is applied, radiation penetrating the junction creates voltage pulses which are recorded.

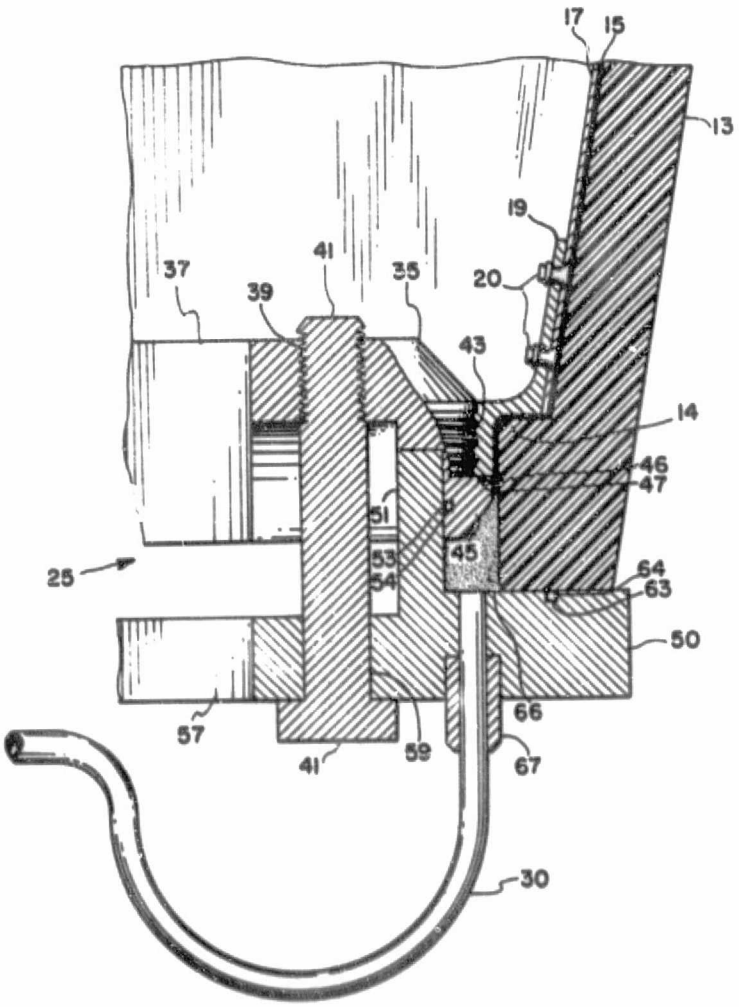
XMS-1177 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



BONDING PROCEDURE

The need for thermal protection of certain metal components from extreme temperatures, such as telemetry antennas on spacecraft during atmospheric reentry, has led to the development of a new bonding procedure. The problems caused by the difference in the coefficients of thermal expansion of a protective layer such as a plastic lamination and the metal surface of the component and also the presence of entrained air or vapors in the bonding material have been met by this method of bonding polytetrafluoroethylene to a magnesium alloy surface using a suitable thermosetting epoxy adhesive.

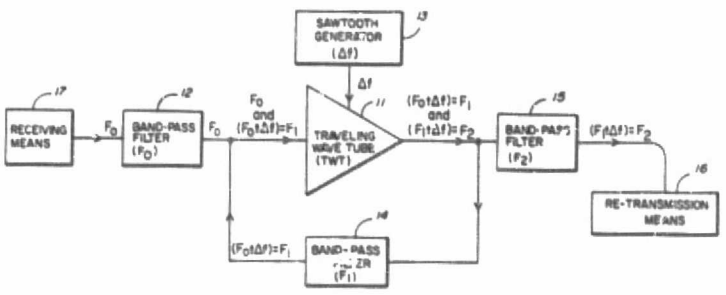
XLA-1262 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



FREQUENCY CONVERTER RE-ENTRY AMPLIFIER

It is essential in many communications systems that microwave carrier frequency signals be amplified. This is generally accomplished by an active repeater which receives the signal, amplifies it, converts it to another microwave frequency and then re-transmits it. The frequency conversion prevents feedback which would cause spurious oscillations in the system. This invention utilizes a traveling wave tube to carry out the dual function of amplifying an input signal and also shifting its frequency. Thus a simple system of few components is used which requires less power for operation and accordingly has application in communications satellite systems.

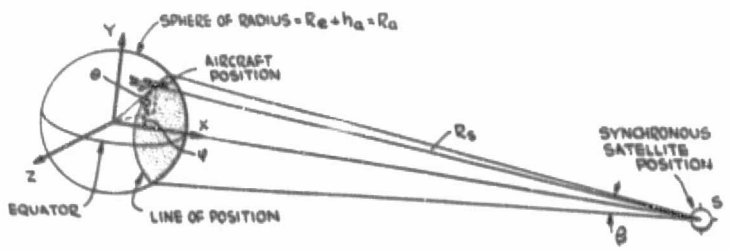
XGS-1022 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



TRAFFIC CONTROL SYSTEM AND METHOD

(Same as GSC 10087-1, appearing 4 pages earlier)

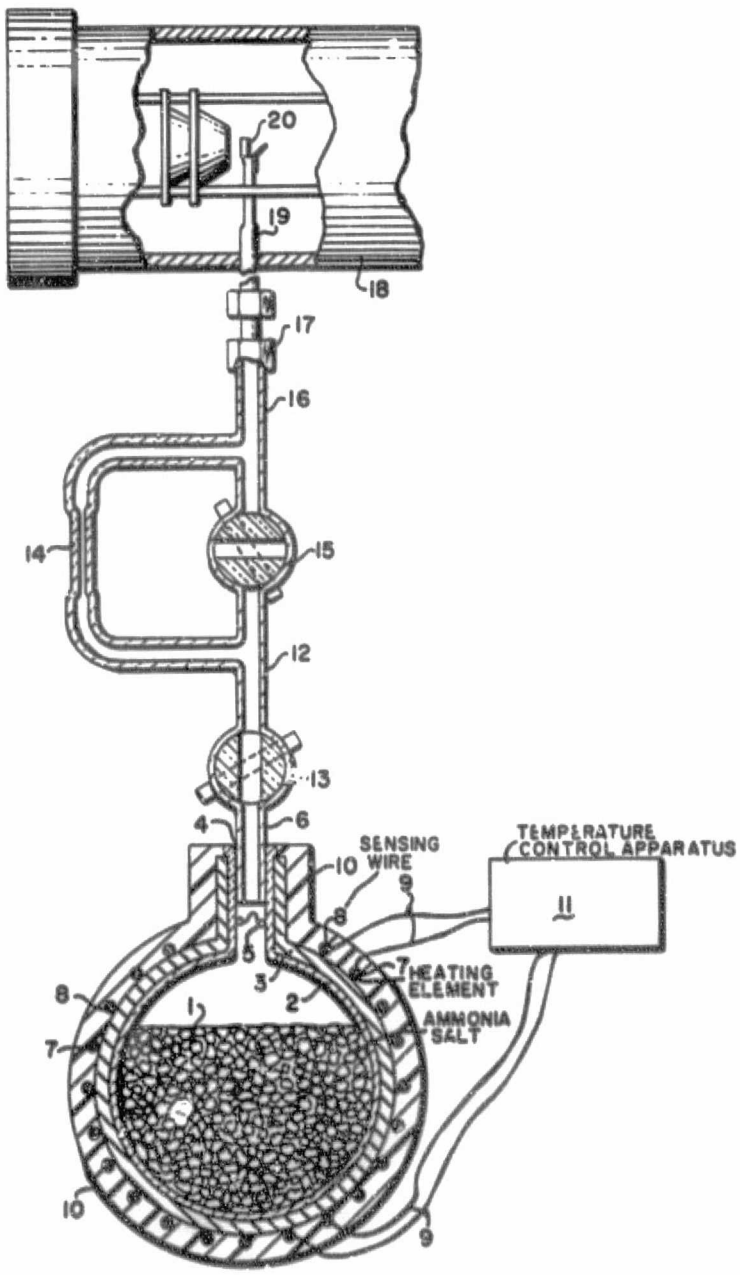
GSC-10087-2 Australia, Belgium, Canada, France, Italy, Japan, Switzerland, United Kingdom, West Germany



SOLID STATE CHEMICAL SOURCE FOR AMMONIA BEAM MASER

Ammonia gas beam-type masers have in the past used liquid ammonia sources. Due to the high vapor pressure of liquid ammonia (on the order of 9 atmospheres at room temperature), it has to be stored in heavy stainless steel cylinders equipped with elaborate pressure reducing valves. This invention comprises an apparatus for generating gaseous ammonia from a solid state source, thus eliminating the need for storing the ammonia in the liquid state.

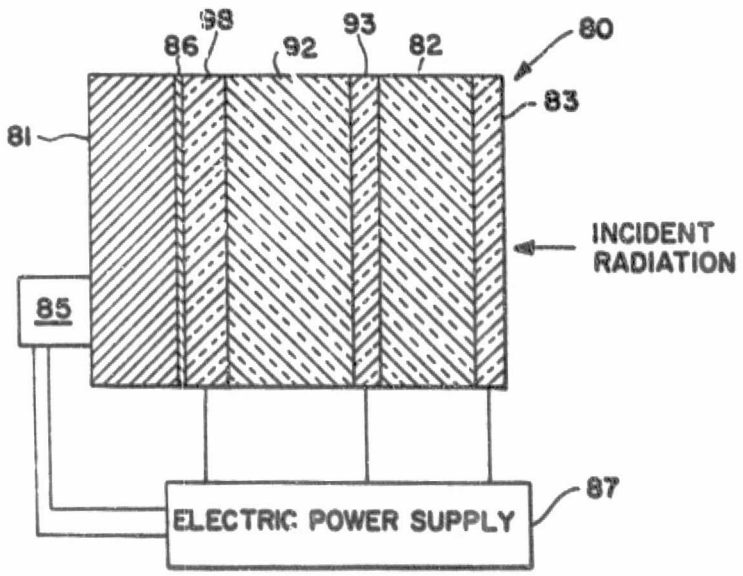
XGS-1504 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany



THERMAL CONTROL PANEL

It is necessary to protect the interior of space vehicles from the extreme environmental temperature changes encountered in space missions. For this purpose a thermo-sensitive panel construction has been developed for achieving selectively changeable and controllable surface solar absorptivity/emissivity ratios. The result is obtained by altering the molecular structure of the panel construction through such changes as electro-luminescence, semiconductivity, photovoltaic effect and electro-optical polarization.

XLA-7728 Belgium, Canada, France, Japan, United Kingdom, West Germany



ALKALI METAL SILICATE PROTECTIVE COATING

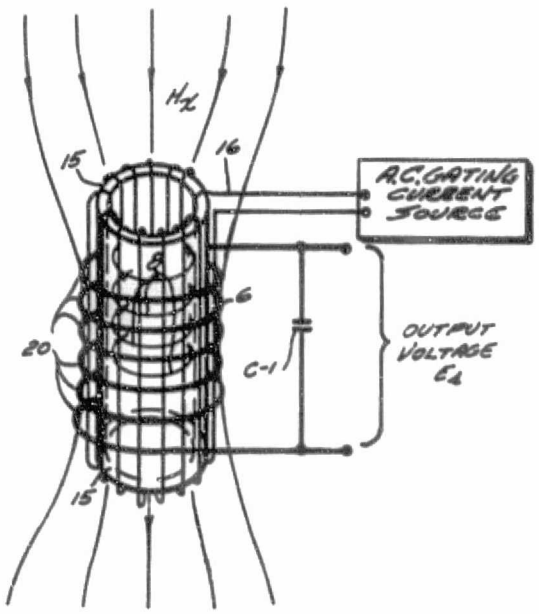
A series of completely inorganic paints, originally developed for satellite use, formulated with an alkali-metal silicate solution as a vehicle, a phosphate as a wetting agent, a pigment as a coloring agent and filler, and water as a thinner. These paints are nontoxic, durable, water insoluble, have excellent ultra-violet radiation resistance, and are highly adherent to various surfaces exposed to a wide range of temperatures.

XGS-4119, XGS-4799 Australia, Belgium, Canada, France, Holland, Italy, Japan, Sweden, Switzerland, United Kingdom, West Germany

FLUX GATE MAGNETOMETER

A magnetometer of the flux gate type in which gating flux leakage is minimized and substantially completely decoupled from the ambient flux to be measured through unique geometry of magnetic material and flux gate design. The flux sensing device basically employs a tubular core having a toroidal gating coil wound thereon and a surrounding solenoidal signal output coil.

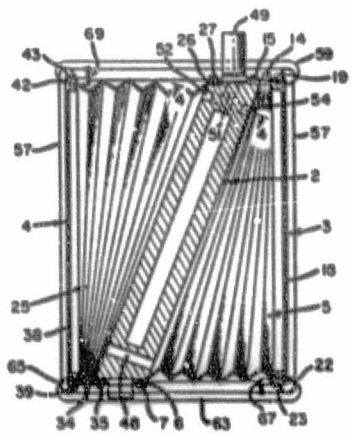
XGS-1881 Canada, United Kingdom



BALANCED BELLOWS SPIROMETER

A laboratory instrument for measuring total lung capacity, vital capacity, maximum breathing capacity, tidal volume, functional residual capacity and oxygen uptake of human subjects. The spirometer, which employs two mechanically interconnected bellows, is compact, retains calibration, and is unaffected by acceleration fields along all three coordinate axes.

XAC-1547 Canada, France, United Kingdom, West Germany



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Washington, D.C. 20546

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An application for a patent license shall include:

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   - U.S. Patent No. or Application No. (if known)
   - NASA Tech Brief No. (if applicable)
   - Other identification of invention (if any)
2. Name and address of company or organization applying for license
3. Name and address of representative or applicant to whom correspondence should be sent
4. Nature and type of applicant's business
5. Number of employees
6. Identification of source of information about the availability of a license on this invention
7. Purpose for which license is desired.

An application for exclusive license shall also include:

8. Applicant's status, if any, in any one or more of the following categories: (a) small business firms; (b) location in a surplus labor area; (c) location in a low income urban area; and (d) location in an area designated by the Government as economically depressed.

9. A description of applicant's capability to undertake the industrial marketing and development required to achieve the practical application of the invention.
10. The time and expenditure which the applicant estimates to be required to develop the invention to the point of practical application and the applicant's intention to invest that sum of money in development of the invention if the license is granted.
11. Whether the applicant would be willing to accept an exclusive license in a limited field of use or for any geographic portion less than the entirety of the United States of America, its territories and possessions, and if so, define the geographic portion or limited field.
12. Any other facts which the applicant believes to show it to be in the interests of the United States of America for the Administration to grant an exclusive license rather than a nonexclusive license and that such an exclusive license should be granted to the applicant.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

U.S. PATENTS AVAILABLE FOR LICENSING

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Patent No.	Date	Title
2,837,706	6-3-58	Line Following Servosystem
2,898,889	8-11-59	Mechanically-Limited Electrically Operated Hydraulic Valve System for Aircraft Controls
2,903,307	9-8-59	Two Component Bearing
2,926,123	2-23-60	Temperature Reducing Coating for Metals Subject to Flame Exposure
2,934,331	4-26-60	Apparatus for Making a Metal Slurry Product
2,940,259	6-14-60	Rocket Propellant Injector
2,944,316	7-12-60	Process of Casting Heavy Slips
2,945,667	7-19-60	Flexible Seal for Valves
2,956,772	10-18-60	Liquid-Spray Cooling Method
2,971,837	2-14-61	High Temperature Nickel-Base Alloy
2,971,838	2-14-61	High Temperature Nickel-Base Alloy
2,974,925	3-14-61	External Liquid-Spray Cooling of Turbine Blades
2,984,735	5-16-61	Runway Light
2,991,671	7-11-61	Wire Grid Forming Apparatus
2,991,961	7-11-61	Jet Aircraft Configuration
2,996,212	8-15-61	Self Supporting Space Vehicle
2,997,274	8-22-61	Turbo-Machine Blade Vibration Damper
3,001,363	9-26-61	Spherical Solid-Propellant Rocket Motor
3,001,395	9-26-61	Air Frame Drag Balance
3,001,739	9-26-61	Aerial Capsule Emergency Separation Device
3,004,735	10-17-61	Particle Detection Apparatus
3,005,081	10-17-61	High Intensity Heat and Light Unit
3,005,339	10-24-61	Wind Tunnel Airstream Oscillating Apparatus
3,008,229	11-14-61	Process for Applying a Protective Coating for Salt Bath Brazing
3,010,372	11-28-61	Folding Apparatus
3,011,760	12-5-61	Transportation Cooled Turbine Blade Manufactured from Wires
3,012,400	12-21-61	Nozzle
3,012,407	12-21-61	Insulating Structure
3,016,693	1-16-62	Electro-Thermal Rocket
3,016,863	1-15-62	Hydrofoil
3,022,672	2-27-62	Differential Pressure Cell
3,024,659	3-13-62	Magnetically Centered Liquid Column Float
3,028,122	4-3-62	Landing Arrangement for Aerial Vehicles
3,028,126	4-3-62	Three Axis Controller
3,028,128	4-3-62	Reentry Vehicle Leading Edge
3,038,077	6-5-62	Infrared Scanner
3,038,175	6-12-62	Survival Couch
3,041,587	6-26-62	Angular Measurement System
3,041,924	7-3-62	Motion Picture Camera for Optical Pyrometry
3,045,424	7-24-62	Method for Continuous Variation of Propellant Flow and Thrust in Propulsive Devices
3,049,876	8-21-62	Annular Rocket Motor and Nozzle Configuration
3,053,484	9-11-62	Variable Sweep Wing Configuration
3,057,597	10-9-62	Modification and Improvements to Cooled Blades
3,059,220	10-16-62	Apparatus for Coupling a Plurality of Ungrounded Circuits to a Gounded Circuit
3,063,291	11-13-62	High Vacuum Condenser Tank for Ion Rocket Engines
3,064,928	11-20-62	Variable Sweep Wing Aircraft
3,067,573	12-11-62	Telescoping-Spike Supersonic Inlet for Aircraft Engines
3,068,658	12-18-62	Venting Vapor Apparatus
3,069,123	12-18-62	Instrument Support with Precise Lateral Adjustment
3,070,330	12-25-62	Attitude and Propellant Flow Control System and Method
3,070,349	12-25-62	Multistage Multiple-Reentry Turbine
3,070,407	12-25-62	Air Bearing
3,072,574	1-8-63	Gas Lubricant Compositions
3,076,065	1-29-63	High-Speed Low-Level Electrical Stepping Switch
3,077,599	2-12-63	Collapsible Loop Antenna for Space Vehicle
3,079,113	2-26-63	Vehicle Parachute and Equipment Jettison System
3,080,711	3-12-63	Penshape Exhaust Nozzle for Supersonic Engine
3,083,611	4-2-63	Multi-Lobar SCAN Horizon Sensor
3,084,421	4-9-63	Reinforced Metallic Composites
3,085,165	4-9-63	Ultra-Long Monostable Multivibrator Employing Bistable Semiconductor Switch to Allow Charging or Timing Circuit
3,087,692	4-30-63	Variable-Span Aircraft
3,088,441	5-7-63	Valve Actuator
**3,090,212	5-21-63	Sandwich Panel Construction
3,090,580	5-21-63	Space and Atmospheric Reentry Vehicle
3,093,000	6-11-63	Check Valve Assembly for a Probe
3,093,346	6-11-63	Space Capsule
3,098,630	7-23-63	Annular Supersonic Decelerator or Drogue
**3,100,294	8-6-63	Time-Division Multiplexer
3,100,990	8-20-63	Two-Plane Balance
3,102,948	9-3-63	Electric Arc Welding
3,104,079	9-17-63	Variable-Geometry Winged Reentry Vehicle
**3,104,082	9-17-63	Variable Sweep Aircraft Wing
3,105,515	10-1-63	Pressure Regulating System
**3,106,603	10-8-63	High Voltage Cable
3,108,171	10-22-63	Radiant Heater Having Formed Filaments

Patent No.	Date	Title
3,110,318	11-12-63	Slosh Suppressing Device and Method
3,112,672	12-3-63	Umbilical Separator for Rockets
3,115,630	12-24-63	Reflector Space Satellite
3,118,100	1-14-64	Electric Battery and Method of Operating the Same
3,119,232	1-28-64	Rocket Engine
3,120,101	2-4-64	Channel Type Shell Construction for Rocket Engine and the Like
3,120,361	2-4-64	Landing Arrangement for Aerospace Vehicle
3,120,738	2-11-64	Ignition System for Monopropellant Combustion Devices
3,121,309	2-18-64	Spherically Shaped Rocket Motor
3,122,000	2-25-64	Apparatus for Transferring Cryogenic Liquids
3,122,098	2-25-64	Apparatus and Method for Control of a Solid Fueled Rocket Vehicle
3,122,885	3-3-64	Injector for Bipropellant Rocket Engines
3,123,248	3-3-64	Expulsion Bladder Equipped Storage Tank Structure
**3,127,157	3-31-64	Multiple Belleville Spring Assembly
3,128,389	4-7-64	Variable Frequency Magnetic Multivibrator
3,128,845	4-14-64	Despin Weight Release
3,130,940	4-28-64	Heat Shield
3,132,342	5-5-64	Antenna System Using Parasitic Elements and Two Driven Elements at 90° Angle Fed 180° Out of Phase
3,132,476	5-12-64	Thrust Vector Control Apparatus
3,132,479	5-12-64	Universal Restrainer and Joint
**3,132,903	5-12-64	Slit Regulated Gas Journal Bearing
3,135,089	6-2-64	Decomposition Unit
3,135,090	6-2-64	Rocket Motor System
3,136,123	6-9-64	Rocket Engine Injector
3,138,837	6-30-64	Method of Making Fiber Reinforced Metallic Composites
3,139,725	7-7-64	Steerable Solid Propellant Rocket Motor
**3,140,728	7-14-64	High Pressure Four-Way Valve
3,141,340	7-21-64	Gravity Device
3,141,769	7-21-64	Method of Producing Porous Tungsten Ionizers for Ion Rocket Engines
3,141,932	7-21-64	Switching Mechanism with Energy Storage Means
**3,143,321	8-4-64	Frangible Tube Energy Dissipation
3,143,651	8-4-64	X-Ray Reflection Collimator Adapted For Focus X-Radiation Directly On A Detector
3,144,219	8-11-64	Manned Space Station
3,144,999	8-18-64	Propellant Blade Loading Control
3,145,874	8-18-64	Means For Controlling Repture Of Shock Tube Diaphrams
3,147,422	9-1-64	Electronic Motor Control System
3,149,897	9-22-64	Printed Cable Connector
3,150,329	9-22-64	Variable Frequency Magnetic Coupled Multivibrator
**3,150,387	9-29-64	Foam Generator
*3,152,344	10-13-64	Life Preserver
3,155,992	11-10-64	Life Raft
3,156,090	11-10-64	Ion Rocket
3,157,529	11-17-64	Bonded Solid Lubricant Coating
3,158,172	11-24-64	High-Temperature, High-Pressure Spherical Segment Valve
3,158,336	11-24-64	Assembly for Recovering a Capsule
**3,158,764	11-24-64	Two-Fluid Magnethydrodynamic System and Method for Thermal-Electric Power Conversion
3,159,967	12-8-64	Variable Thrust Ion Engine Utilizing Thermally Decomposable Solid Fuel
**3,160,825	12-8-64	Temperature Compensating Means for Cavity Resonator of Amplifier
**3,160,950	12-15-64	Method and Apparatus for Shock Protection
3,162,012	12-22-64	Formed Metal Ribbon Wrap
**3,163,935	1-5-65	Mechanical Coordinate Converter
3,164,222	1-5-65	Non-Reusable Kinetic Energy Absorber
3,164,369	1-5-65	Multistage Multiple-Reentry Turbine
3,165,356	1-12-65	Shock Absorbing Support and Restraint Means
3,166,834	1-26-65	Catalyst Bed Removing Tool
3,167,426	1-26-65	Nickel-Base Alloy
3,168,827	2-9-65	Airplane Take-off Performance Indicator
*3,169,001	2-9-65	Aircraft Wheel Spray Drag Alleviator
**3,169,613	2-16-65	Elastic Universal Joint
**3,169,725	2-16-65	Erectable Modular Space Station
3,170,286	2-23-65	Injector Valve Device
3,170,290	2-23-65	Liquid Rocket System
3,170,295	2-23-65	Propellant Tank Pressurization System
3,170,324	2-23-65	Aerodynamic Measuring Device
**3,170,471	2-23-65	Inflatable Honeycomb
3,170,486	2-23-65	Two-Component Valve Assembly
3,170,605	2-23-65	Ejection Valve
3,170,657	2-23-65	Landing Arrangement for Aerial Vehicle
3,170,660	2-23-65	Parachute Glider
3,170,773	2-23-65	Reinforced Metallic Composites
3,171,060	2-23-65	Plasma Accelerator
3,171,081	2-23-65	Ionization Vacuum Gauge
3,172,097	3-2-65	Binary to Binary-Coded-Decimal Converter
3,173,246	3-16-65	Colloid Propulsion Method and Apparatus
3,173,251	3-16-65	Apparatus for Igniting Solid Propellants
3,174,278	3-23-65	Continuously Operating Induction Plasma
3,174,279	3-23-65	Rocket Thrust Chamber
3,174,827	3-23-65	Production of High Purity Silicon Carbide
3,175,789	3-30-65	Landing Pad Assembly for Aerospace Vehicles
3,176,222	3-30-65	Apparatus Having Coaxial Capacitor Structure for Measuring Fluid Density
3,176,499	4-6-65	High Temperature Testing Apparatus
3,176,933	4-6-65	Thermal Control of Space Vehicles
*3,177,933	4-13-65	Thermal Switch
3,178,883	4-20-65	Attitude Control for Spacecraft
3,180,264	4-27-65	Coupling for Linear Shaped Charge
3,180,587	4-27-65	Attitude Orientation of Spin-Stablized Space Vehicles
3,181,821	5-4-65	Spacecraft Soft Landing System
3,182,496	5-11-65	Electric Arc Driven Wind Tunnel
3,183,506	5-11-65	Radar Ranging Receiver
3,185,023	5-25-65	Optical Inspection Apparatus
3,187,583	6-8-65	Space Simulator
3,188,472	6-8-65	Method and Apparatus for Determining Satellite Orientation Utilizing Spatial Energy Sources
3,188,844	6-15-65	Electrical Discharge Apparatus for Forming
3,189,299	6-15-65	Dynamic Precession Damper for Spin Stabilized Vehicles
**3,189,535	6-15-65	Means and Method of Depositing Thin Films on Substrates
3,189,726	6-15-65	High Temperature Heat Source
3,189,794	6-15-65	Relay Binary Circuit
3,189,864	6-15-65	Electrical Connector for Flat Cables
3,191,316	6-29-65	Lunar Landing Flight Research Vehicle
3,191,379	6-29-65	Propellant Grain for Rocket Motors

Patent No.	Date	Title
3,191,907	6-29-65	Conical Valve Plug
3,192,730	7-6-65	Helium Refining by Superfluidity
3,193,883	7-13-65	Mandrel for Shaping Solid Propellant Rocket Fuel into a Motor Casing
3,194,060	7-13-65	Seismic Displacement Transducer
3,194,525	7-13-65	Supporting and Protecting Device
3,194,951	7-13-65	Logarithmic Converter
3,196,261	7-20-65	Full Binary Adder
3,196,362	7-20-65	Temperature Compensated Solid State Differential
3,196,557	7-27-65	Centrifuge Mounted Missile Simulator
3,196,558	7-27-65	Means for Visually Indicating Flight Paths of Vehicles Between the Earth
3,196,598	7-27-65	Inlet Deflector for Jet Engines
3,196,675	7-27-65	Optical Torquemeter
3,196,690	7-27-65	Impact Simulator
3,197,616	7-27-65	Temperature Regulation Circuit
3,198,955	8-3-65	Binary Magnetic Memory Device
3,199,340	8-10-65	Accelerometer with F.M. Output
3,199,343	8-10-65	Electric Propulsion Engine Test Chamber
3,199,931	8-10-65	Externally Pressurized Fluid Bearing
3,200,706	8-17-65	Gas Actuated Bolt Disconnect
3,201,560	8-17-65	Electric-Arc Heater
3,201,635	8-17-65	Method and Apparatus for Producing a Plasma
3,201,980	8-24-65	Thrust Dynamometer
3,202,381	8-24-65	Recoverable Rocket Vehicle
3,202,398	8-24-65	Locking Device for Turbine Rotor Blades
3,202,844	8-24-65	Energy Conversion Apparatus
3,202,915	8-24-65	Particle Beam Measurement Apparatus Using Beam Kinetic Energy to Change the Heat Sensitive Resistance of the Detection Probe
**3,202,998	8-24-65	Flexible Foam Erectable Space Structure
3,204,447	9-7-65	Enthalphy and Stagnation Temperature Determination of a High Temperature Laminar Flow Gas Stream
3,204,889	9-7-65	Space Vehicle Electrical System
3,205,361	9-7-65	Light Sensitive Digital Aspect Sensor
3,205,362	9-7-65	Photosensitive Device to Detect Bearing Deviation
3,205,381	9-7-65	Ionospheric Battery
3,206,141	9-14-65	Space Vehicle Attitude Control
3,208,215	9-28-65	Gimbaled, Partially Submerged Rocket Nozzle
3,208,272	9-28-65	Surface Roughness Detector
3,208,694	9-28-65	Nose Gear Steering System for Vehicle with Main Skid
3,208,707	9-28-65	Pivotal Shock Absorbing Pad Assembly
3,209,360	9-28-65	Antenna Beam-Shaping Apparatus
3,209,361	9-28-65	Cassegrainian Antenna Subreflector Flange for Supressing Ground Noise
3,210,927	10-12-65	Electro-Thermal Rockets Having Improved Heat Exchangers
3,211,169	10-12-65	Shrink-fit Gas Valve
3,211,414	10-12-65	Thermally Operated Valve
3,212,096	10-12-65	Parabolic Reflector Horn Feed With Spillover Correction
3,212,259	10-15-65	Tertiary Flow Injection Thrust Vectoring System
3,212,325	10-12-65	Force Measuring Instrument
3,212,564	10-19-65	Heat Conductive Resiliently Compressible Structure for Space Electronic Package Modules
3,215,572	11-02-65	Low Viscosity Magnetic Fluid Obtained by the Colloidal Suspension of Magnetic Particles
*3,215,842	11-02-65	Optical Communication System
3,216,007	11-02-65	Analog-to-Digital Conversion System
**3,217,624	11-16-65	Electrically-operated Rotary Shutter
3,218,479	11-16-65	Phase Detector Assembly
3,218,547	11-16-65	Flux Sensing Device Using a Tubular Core with Toroidal Gating Coil and Solenoidal Output Coil
3,218,850	11-23-65	Thermo-protective Device for Balances
3,219,250	11-23-65	Flexible Back-up Bar
3,219,365	11-23-65	Spherical Shield
3,219,828	11-23-65	Vibrating Reticle Star Tracker
3,220,004	11-23-65	Passive Communication Satellite
3,221,547	12-7-65	Apparatus for Absorbing and Measuring Power
**3,221,549	12-7-65	Aircraft Instrument
*3,223,374	12-14-65	Miniature Vibration Isolator
3,224,001	12-14-65	Inflatable Radar Reflector Unit
3,224,173	12-21-65	Liquid-gas Separator System
3,224,263	12-21-65	Null-type Vacuum Microbalance
3,224,336	12-21-65	Missile Launch Release System
3,228,492	1-11-66	Double-Acting Shock Absorber
3,228,558	1-11-66	Measuring Device
3,229,099	1-11-66	Electro-Optical Alignment Control System
3,229,102	1-11-66	Radiation Direction Detector Including Means for Compensating for Photocell Aging
3,229,139	1-11-66	High Temperature Spark Plug
3,229,155	1-11-66	Electric Arc Device for Heating Gases
3,229,463	1-18-66	Trajectory-correction Propulsion System
3,229,568	1-18-66	Concave Grating Spectrometer
3,229,636	1-18-66	Missile Stage Separation Indicator and Stage Initiator
3,229,682	1-18-66	Device for Directionally Controlling Electromagnetic Radiation
3,229,689	1-18-66	Resuscitation Apparatus
3,229,884	1-18-66	Segmented Back-up Bar
3,229,930	1-18-66	Stretch Yo-Yo De-spin Mechanism
**3,230,053	1-18-66	Apparatus for Producing High Purity Silicon Carbide Crystals
3,230,377	1-18-66	Self-stablized Theodolite for Manual Tracking Using Photosensitive Stablizing Means
3,236,066	2-22-66	Energy Absorption Device
3,237,253	3-1-66	Method of Making Screen by Casting
3,238,345	3-1-66	Hypersonic Test Facility
3,238,413	3-1-66	Magnetically Controlled Plasma Accelerator
3,238,715	3-8-66	Electrostatic Ion Engine Having a Permanent Magnetic Circuit
3,238,730	3-8-66	Anti-backlash Circuit for Hydraulic Drive System
3,238,774	3-8-66	Pressurized Cell Micrometeroroid Detector
*3,238,777	3-8-66	Differential Temperature Transducer
3,239,660	3-8-66	Illumination System Including a Virtual Light Source
3,242,716	3-29-66	Apparatus for Measuring Thermal Conductivity
3,243,154	3-29-66	Vibration Damping System
3,243,791	3-29-66	Bi-carrier Demodulator with Modulation
3,249,012	5-3-66	Umbilical Disconnect
**3,249,013	5-3-66	Remote Controlled Tubular Disconnect
3,251,053	5-10-66	Analog to Digital Converter
3,252,100	5-17-66	Pulse Generating Circuit
3,254,395	6-7-66	Method for Making a Rocket Motor Casing
3,254,487	6-7-66	Rocket Motor Casing
3,257,780	6-28-66	Zero Gravity Separator
3,258,582	6-28-66	Energy Management System for Glider Type Vehicle
3,258,687	6-28-66	Wide Range Linear Fluxgate Magnetometer
3,258,831	7-5-66	Method of Making a Molded Connector

Patent No.	Date	Title
3,258,912	7-5-66	Method of Igniting Solid Propellants
3,258,918	7-5-66	Fluid Dispensing Apparatus and Method
**3,260,055	7-12-65	Automatic Thermal Switch
3,260,204	7-12-66	Velocity Package
3,260,326	7-12-66	Wind-tunnel Microphone Structure
3,261,210	7-19-66	Superconductive Accelerometer
3,262,186	7-26-66	Method of Improving the Reliability of a Rolling Element System
3,262,262	7-26-66	Electrostatic Ion Rocket Engine
3,262,351	7-26-66	Separation Nut
3,262,365	7-26-66	Space Capsule Ejection Assembly
3,262,395	7-26-66	Hydraulic Transformer
3,262,518	7-26-66	Emergency Escape System
3,262,655	7-26-66	Alleviation of Divergence During Rocket Launch
3,263,016	7-26-66	Black-body Furnance
3,263,171	7-26-66	Micro Current Measuring Device Using Plural Logarthmic Response Heated Gilamentrary Type Diodes
3,263,610	8-2-66	Quick-Release Connector
**3,264,135	8-2-66	Method of Coating Carbonaceous Base To Prevent Oxidation Destruction and Coated Base
3,270,441	9-6-66	Reduced Gravity Similator
3,270,499	9-6-66	Injector Assembly for Liquid Fueled Rocket Engines
3,270,501	9-6-66	Aerodynamic Spike Nozzle
3,270,503	9-6-66	Ablation Structures
3,270,504	9-6-66	Automatically Deploying Nozzle Exit Cone Extension
3,270,505	9-6-66	Control System for Rocket Vehicles
**3,270,512	9-6-66	Intermittent Type Silica gel Absorption Refrigerator
3,270,565	9-6-66	Omnidirectional Acceleration Device
3,270,756	9-6-66	Fluid Flow Control Valve
3,270,802	9-6-66	Method and Apparatus for Varying Thermal Conductivity
3,270,835	9-6-66	Device for Suppressing Sound and Heat Produced by High-velocity Exhaust Jets
3,270,908	9-6-66	Space Capsule
3,270,985	9-6-66	Reactance Control System
3,270,986	9-6-66	Hand-held Self-maneuvering Unit
3,270,988	9-6-66	Minimum Induced Drag Airfoil Body
**3,270,989	9-6-66	Variable Sweep Aircraft
3,270,990	9-6-66	Absorptive Splitter for Closely Spaced Supersonic Engine Air Inlets
3,271,140	9-6-66	High Temperature Cobalt-Base Alloy
**3,271,181	9-6-66	Method of Coating Carbonaceous Base To Prevent Oxidation Destruction and Coated Base
3,271,532	9-6-66	Three-axis Finger Tip Controller for Switches
3,271,558	9-6-66	Spectral Method for Monitoring Atmospheric Contamination of Inert-gas Welding Shields
3,271,594	9-6-66	Transient Augmentation Circuit for Pulse Amplifiers
**3,271,620	9-6-66	Starting Circuit for Vapor Lamps and the Like
3,271,637	9-6-66	Gas Solar Detector Using Manganese as a Doping Agent
3,271,649	9-6-66	Regenerative Braking System
3,273,094	9-13-66	Superconducting Magnet
3,273,355	9-20-66	Heat Protective Apparatus
3,273,381	9-20-66	Means and Method of Measuring Viscoelastic Strain
3,273,388	9-20-66	Apparatus for Measuring Electric Field Strength on the Surface of a Model Vehicle
3,273,392	9-20-66	Hot Wire Liquid Level Detector for Cryogenic Fluids
3,273,399	9-20-66	Traversing Probe
3,274,304	9-20-66	Method of Making Impurity-Type Semiconductor Electrical Contacts
*3,276,251	10-4-66	Test Unit Free-Flight Suspension System
3,276,376	10-4-66	Thrust and Direction Control Apparatus
3,276,602	10-4-66	Cable Arrangement for Rigid Tethering
3,276,679	10-4-66	Separator
3,276,722	10-4-66	Flight Craft
3,276,726	10-4-66	Inflation System for Balloon Type Satellites
3,276,865	10-4-66	High Temperature Cobalt-Base Alloy
3,276,866	10-4-66	Nickel-Base Alloy Containing Mo-W-Al-Cr-Ta-Zr-C-Nb-B
3,276,946	10-4-66	Low Friction Magnetic Recording Tape
3,277,314	10-4-66	High-Efficiency Multivibrator
3,277,366	10-4-66	Insertion Loss Measuring Apparatus Having Transformer Means Connected Across a Pair of Bolometers
3,277,373	10-4-66	Serrodyne Frequency Converter Reentrant Amplifier System
3,277,375	10-4-66	Reentry Communication by Material Addition
3,277,458	10-4-66	Condition and Condition Duration Indicator
3,277,486	10-4-66	Method and Means for Damping Nutation in a Satellite
3,279,193	10-18-66	Method and Construction for Protecting Heat Sensitive Bodies From Thermal Radiation and Convective Heat
3,281,963	11-01-66	Training Vehicle for Controlling Attitude
3,281,964	11-01-66	Rotating Space Station Simulator
**3,281,965	11-01-66	Controlled Visibility Device for an Aircraft
3,282,035	11-01-66	Molecular Beam Velocity Selector
3,282,091	11-01-66	Instrument for Measuring Torsional Creep and Recovery
3,282,532	11-01-66	Stabilization of Gravity Oriented Satellites
3,282,541	11-01-66	Attitude Control System for Sounding Rockets
3,282,739	11-01-66	Non-magnetic Battery Case
**3,282,740	11-01-66	Sealed Battery Gas Manifold Construction
3,283,088	11-01-66	Multiple Circuit Switch Apparatus With Improved Pivot Actuator Structure
3,283,175	11-01-66	AC Logic Flip-Flop Circuits
3,283,241	11-01-66	Apparatus for Field Strength Measurement of a Space Vehicle
3,286,274	11-22-66	Pressure suit tie-down mechanism
3,286,531	11-22-66	Omni-Directional Anisotropic Molecular Trap
3,286,629	11-22-66	Multi-mission module
3,286,630	11-22-66	Spacecraft separation system for spinning vehicles and/or payloads
3,286,882	11-22-66	Booster tank system
3,286,953	11-22-66	Roll attitude star sensor system
3,286,957	11-22-66	Flexible wing deployment device
3,287,031	11-22-66	Indexed Keyed Connection
3,287,174	11-22-66	Prevention of pressure build-up in electrochemical cells
3,287,496	11-22-66	Digital television camera control system
3,287,582	11-22-66	Apparatus for increasing ion engine beam density
3,287,640	11-22-66	Pulse Counting circuit which simultaneously indicates the occurrence of the Nth pulse
**3,287,660	11-22-66	Solid State chemical source for ammonia beam maser
3,287,725	11-22-66	Phase-locked loop with a sideband rejecting properties
3,289,205	11-29-66	Method & Apparatus for determining Electromagnetic characteristics of Large Surface Area Passive Reflectors

Patent No.	Date	Title
3,295,360	01-03-67	Dynamic sensor
*3,295,366	01-03-67	Support apparatus for dynamic testing
3,295,377	01-03-67	Angular accelerometer
3,295,386	01-03-67	Three axis controller
3,295,512	01-03-67	Foldable solar concentrator
3,295,545	01-03-67	Liquid storage tank venting device for zero gravity environment
3,295,556	01-03-67	Foldable conduit
**3,295,684	01-03-67	High pressure filter
3,295,699	01-03-67	Folding boom assembly
3,295,782	01-03-67	Endless tape cartridge
3,295,790	01-03-67	Recoverable single stage spacecraft booster
3,295,791	01-03-67	Storage container mounting for space vehicles
3,295,798	01-03-67	Landing gear
**3,295,808	01-03-67	Parallel motion suspension device
3,296,060	01-03-67	Unrefined-ceramic flame resistant insulation and method of making the same
3,296,526	01-03-67	Micrometeroid velocity measuring device
3,296,531	01-03-67	Electrostatic plasma modulator for space vehicle re-entry communication
3,298,175	01-17-67	Method and device for cooling
3,298,182	01-17-67	Ignition means for monopropellant
3,298,221	01-17-67	Densitometer
3,298,285	01-17-67	Reinforcing means for diaphragms
3,298,362	01-17-67	Instrument for use in performing a controller Valsalva Maneuver
3,298,582	01-17-67	Camera film feed having a detent means
*3,299,364	01-17-67	Folded traveling wave maser structure
3,299,431	01-17-67	Unfurlable structure including coiled strips thrust launched upon tension release
3,299,913	01-24-67	Adjustable Tension Wire Guide
3,300,162	01-24-67	Radial module space station
3,300,717	01-24-67	Method & Apparatus for measuring potentials in plasmas
3,300,721	01-24-67	Means for communication through a layer of ionized gases
3,300,847	01-31-67	Portable alignment tool
3,300,949	01-31-67	Liquid-gas separator for zero gravity environment
3,300,981	01-31-67	Zero gravity starting means for liquid propellant motors
3,301,046	01-37-67	Method of obtaining permanent record of surface flow phenomena
3,301,315	01-31-67	Thermal conductive connection and method of making same
3,301,507	01-31-67	Hypersonic Re-entry Vehicle
3,301,511	01-31-67	Wing Deployment Method and Apparatus
3,301,578	01-31-67	Cryogenic connector for vacuum use
3,302,023	01-31-67	Apparatus for producing three dimensional recordings of fluorescense spectra
3,302,040	01-31-67	Linear sawtooth voltage-wave generator employing transistor timing circuit having capacitor-zener diode combination feedback
3,302,569	02-07-67	Quick release separation mechanism
3,302,633	02-07-67	Universal pilot restraint suit and body support therefor
*3,302,662	02-07-67	Antiflutter ball check valve
3,302,960	02-07-67	Locking device with rolling detents
3,303,304	02-07-67	Discrete Local Altitude Sensing Device
3,304,028	02-14-67	Attitude control for spacecraft
3,304,718	02-21-67	Double optic system for ion engine
3,304,724	02-21-67	Tank construction for space vehicles
3,304,729	02-21-67	Cryogenic Storage System
*3,304,768	02-21-67	Fatigue testing device
3,304,773	02-21-67	Force transducer
3,304,799	02-21-67	Proportional controller
3,304,865	02-21-67	Self-sealing, unbonded, rocket motor nozzle closure
3,305,415	02-21-67	Process for preparing sterile solid propellants
3,305,636	02-21-67	Phase-shift data transmission system having a pseudo-noise sync code modulated with the data in a single channel
**3,305,801	02-21-67	Variable time constant smoothing circuit
**3,305,810	02-21-67	Solenoid construction
3,305,861	02-21-67	Closed Loop Ranging System
3,305,870	02-21-67	Dual Mode Horn Antenna
3,307,407	03-07-67	Micro-particle impact sensing apparatus
3,308,848	03-14-67	Fluid power transmission
3,309,012	03-14-67	Thermal pump-compressor for space use
3,309,961	03-21-67	Hermetically sealed explosive release mechanism
*3,310,054	03-21-67	File card marker
*3,310,138	03-21-67	Viscous-pendulum damper
3,310,256	03-21-67	Aerodynamic protection for space flight vehicles
3,310,258	03-21-67	Technique for control of free-flight rocket vehicles
3,310,261	03-21-67	Control for flexible parawing
3,310,262	03-21-67	Supersonic Aircraft
3,310,443	03-21-67	Method of forming thin window drifted silicon charged particle detector
3,310,978	03-28-67	Fiber optic vibration transducer and analyzer
3,310,980	03-28-67	Hydraulic support for dynamic testing
**3,311,315	03-28-67	Endless tape transport mechanism
3,311,502	03-28-67	Didymium hydrate additive to nickel hydroxide electrodes
3,311,510	03-28-67	Method of making a silicon semiconductor device
3,311,748	03-28-67	Sun tracker with rotatable plane-parallel plate and two photocells
**3,311,772	03-28-67	Focussing system for an ion source having apertured electrodes
3,311,832	03-28-67	Multiple Input Radio Receiver
3,312,101	04-04-67	Gas Analyzer for Bi-gaseous mixtures
3,316,716	05-02-67	Composite Powerplant and Shroud Therefor
3,316,752	05-02-67	Method and Apparatus for detection and location of microleaks
*3,316,991	05-02-67	Automatic Force measuring system
3,317,180	05-02-67	High Pressure regulator valve
3,317,341	05-02-67	Metallic film diffusion for boundary lubrication
3,317,352	05-02-67	Method for determining the state of charge of batteries by the use of tracers
3,317,641	05-02-67	Method For Molding Compounds
3,317,731	05-02-67	Canopus Detector Including Automative Gain Control of Photomultiplier Tube
3,317,751	05-02-67	Reversible Ring Counter Employing Cascaded Single SCR Stages
3,317,797	05-02-67	Microelectronic Module Package
3,317,825	05-02-67	Three-Wire Ground Type Electrical Receptacle Tester
3,317,832	05-02-67	Single or Joint Amplitude Distrubution Analyzer
3,317,846	05-02-67	Linear Accelerator for Micrometeoroids Having a Variable Voltage Source
3,318,093	05-09-67	Hydraulic Drive Mechanism
3,318,096	05-09-67	Purge Device for Thrust Engines
3,318,343	05-09-67	Tool Attachment for Spreading Loose Elements Away From Work
*3,318,622	05-09-67	All-Directional Fastener
3,319,175	05-09-67	Electronic Amplifier With Power Supply Switching
3,319,979	05-16-67	Quick Attach and Release Fluid Coupling Assembly
3,320,659	05-23-67	Line Cutter
3,321,034	05-23-67	Sample Collecting Impact Bit

Patent No.	Date	Title
3,321,154	05-23-67	Transpirationally Cooled Heat Ablation System
3,321,157	05-23-67	Double-Hinged Flap
3,321,159	05-23-67	Techniques for Insulating Cryogenic Fuel Containers
*3,321,570	05-23-67	Printed circuit board with bellows rivet connection
3,321,628	05-23-67	Baseline stabilization system for ionization detector
**3,321,645	05-23-67	Switching circuit employing regeneratively connected complementary transistors
3,321,922	05-30-67	Small Rocket Engine
3,323,356	06-06-67	Apparatus for Positioning and Loading a test specimen
3,323,362	06-06-67	Positive Displacement Flowmeter
3,323,370	06-06-67	Mass measuring system
**3,323,386	06-06-67	Two-axis controller
3,323,408	06-06-67	Optical alignment system
3,323,484	06-06-67	Liquid Flow Sight Assembly
**3,323,967	06-06-67	Masking Device
3,324,370	06-06-67	Electronic Beam Switching Commutator
3,324,388	06-06-67	Meteoroid sensing apparatus having a coincidence network connected to a pair of capacitors
**3,324,423	06-06-67	Dual waveguide mode source having control means for adjusting the relative amplitudes of two modes
3,324,659	06-13-67	Electrostatic Thrustor with Improved Insulators
3,325,229	06-13-67	Air Bearing
3,325,723	06-13-67	Voltage-current characteristic simulator
3,325,749	06-13-67	Variable Frequency Oscillator with Temperature Compensation
3,326,043	06-20-67	Inductive Liquid Level Detection System
3,326,407	06-20-67	Thin-walled pressure vessel
3,327,298	06-20-67	System for recording and reproducing pulse code modulated data
*3,327,991	06-27-67	Valve seat with Resilient Support Member
3,328,624	06-27-67	High efficiency ionizer assembly
3,329,375	07-04-67	Attitude Control and damping system for spacecraft
3,329,918	07-04-67	High voltage divider system
3,330,052	07-11-67	Subgravity Simulator
**3,330,082	07-11-67	Central sparand module joint
3,330,510	07-11-67	Orbital Escape Device
3,330,549	07-11-67	Shock Absorber
3,331,071	07-11-67	Satellite Communication System
3,331,246	07-18-67	Hypersonic test facility
3,331,255	07-18-67	Non-magnetic, explosive actuated indexing device
3,331,404	07-18-67	Apparatus for purging systems handling
3,331,951	07-18-67	Trigonometric Vehicle Guidance Assembly which aligns the three perpendicular axes of two-axes systems
**3,333,152	07-25-67	Self-repeating plasma accelerator
3,333,788	08-01-67	Artificial gravity spin deployment system
3,336,725	08-22-67	Canister closing device
3,336,748	08-22-67	Plasma Device Feed System
3,337,004	08-22-67	Impact energy absorber
3,337,279	08-22-67	Gas purged dry box glove
3,337,315	08-22-67	Method for Fiberizing Ceramic Materials
3,337,337	08-22-67	Method for producing fiber reinforced metallic composites
**3,337,790	08-22-67	Mercury capillary interrupter
3,337,812	08-22-67	Circulator having quarter wavelength resonant post and parametric amplifier circuits utilizing the same
3,339,404	09-05-67	Lunar Penetrometer
3,339,863	09-05-67	Solar vane actuator
3,340,099	09-05-67	Bonded elastomeric seal for electrochemical cells
3,340,395	09-05-67	Time-of-flight mass spectrometer with feed-back means from the detector to the low sources and a specific counter
3,340,397	09-05-67	Multiple environment materials test chamber having a multiple port X-ray tube for irradiating a plurality of samples
**3,340,430	09-05-67	Diode and protection fuse unit
3,340,532	09-05-67	Tracking receiver
3,340,599	09-12-67	Simple method of making photovoltaic junctions
3,340,713	09-12-67	Spin forming tubular elbows
3,340,727	09-12-67	Ablation Probe
3,340,732	09-12-67	Meteorological Balloon
3,341,151	09-12-67	Apparatus providing a directive field pattern and attitude sensing of a spin stabilized satellite
3,341,169	09-12-67	Filler Valve
3,341,708	09-12-67	Amplitude modulated laser transmitter
3,341,778	09-12-67	Optimum pre-detection diversity receiving system
**3,341,977	09-19-67	Conforming Polisher for aspheric surfaces of revolution
3,342,055	09-19-67	Protective device for machine and metalworking tools
3,342,066	09-19-67	Model launcher for wind tunnels
*3,342,653	09-19-67	Method of making inflatable honeycomb
*3,343,180	09-26-67	Stretcher
3,343,189	09-26-67	Rescue litter floatation assembly
3,344,340	09-26-67	Regulated power supply
3,344,425	09-26-67	Monopulse Tracking System
3,345,820	10-10-67	Electron Bombardment Ion Engine
3,345,822	10-10-67	Burning rate control of solid propellants
3,345,840	10-10-67	Tube Dimpling Tool
*3,345,866	10-10-67	Multilegged Support System
3,346,419	10-10-67	Solar cell mounting
3,346,515	10-10-67	Method of producing alternating ether-siloxane copolymers
3,346,724	10-10-67	Random Function Tracer
3,346,806	10-10-67	Pressure monitoring with a plurality of ionization gauges controlled at a central location
3,346,929	10-17-67	Latching Mechanism
3,347,046	10-17-67	Control of transverse instability in rocket combustors
3,347,057	10-17-67	Rapid cooling method and apparatus
3,347,309	10-17-67	Self Adjusting Multi-Segment, Deployable Natural Circulation Radiator
3,347,465	10-17-67	Prestressed refractor structure
3,347,466	10-17-67	Nacelle Afterbody for jet engines
3,347,531	10-17-67	Stirring apparatus for plural test tubes
3,347,665	10-17-67	Low temperature aluminum alloy
3,348,048	10-17-67	Horizon sensor with a plurality of fixedly-positioned radiation-compensated radiation sensitive detector
3,348,053	10-17-67	Amplifier Clamping Circuit for horizon scanner
3,348,152	10-17-67	Diversity receiving system
3,349,814	10-31-67	Method and apparatus for making a heat insulating and ablative structure
3,350,033	10-31-67	Reaction wheel scanner
3,350,034	10-31-67	Satellite appendage tie-down cord
3,350,643	10-31-67	Signal-to-noise ratio estimated by taking ratio of mean and standard deviation of integrated signal samples
**3,350,671	10-31-67	High power-high voltage waterload
**3,350,926	11-07-67	Miniature Stress Transducer
3,352,157	11-14-67	Inertia diaphragm pressure transducer
*3,352,192	11-14-67	Split nut separation system
3,353,359	11-21-67	Multislot film cooled pyrolytic graphite rocket nozzle
3,354,098	11-21-67	Elastomeric Silazane polymers and process for preparing the same
3,354,320	11-21-67	Light position locating system

Patent No.	Date	Title
3,354,462	11-21-67	Event Recorder
3,355,861	12-05-67	Mixture Separation Cell
3,355,948	12-05-67	Spherical Tank Gauge
3,356,320	12-05-67	Device for Separating Occupant from an ejection seat
*3,356,549	12-05-67	Method and apparatus for bonding a plastics sleeve onto a metallic body
3,356,885	12-05-67	Small plasma probe
3,357,024	12-05-67	Method of recording a gas flow pattern
*3,357,093	12-12-67	Soldering with solder flux which leaves corrosion-resistant coating
3,357,237	12-12-67	Ablation Sensor
3,357,862	12-12-67	Combined Electrolysis device and fuel cell and method of operation
3,358,145	12-12-67	Radiation detector readout system
*3,358,264	12-12-67	Coaxial Cable Connector
3,359,046	12-19-67	Bismuth-lead coatings for gas bearings used in atmospheric environments and vacuum chambers
3,359,132	12-19-67	Method of coating circuit paths on printed circuit boards with solder
3,359,409	12-19-67	Correlation function apparatus
**3,359,435	12-19-67	Holder for crystal resonators
3,359,555	12-19-67	Polarization diversity monopulse tracking receiver
*3,359,819	12-26-67	Bidirectional step torque filter with zero backlash characteristic
*3,359,855	12-26-67	Optical projector system
3,360,798	12-26-67	Collapsible reflector
3,360,864	01-02-68	Internal flare angle gauge
**3,360,972	01-02-68	Magnetomotive metal working device
3,360,980	01-02-68	Vapor pressure measuring system and method
3,360,988	01-02-68	Electric arc apparatus
3,361,045	01-02-68	Fast-opening diaphragm
**3,361,067	01-02-68	Piezoelectric pump
3,361,400	01-02-68	Clamping assembly for components inertial
*3,361,666	01-02-68	Inorganic solid film lubricants
3,361,985	01-02-68	Signal detection and tracking apparatus
3,364,311	01-16-68	Elimination of frequency shift in a multiplex communication system
3,364,366	01-16-68	Multiple Slope Sweep Generator
*3,364,578	01-23-68	Ellipsograph for Pantograph
3,364,631	01-23-68	Inflatable Support Structure
3,364,777	01-23-68	Null Device for Hand Controller
3,364,813	01-23-68	Self-Calibrating displacement transducer
3,365,580	01-23-68	Film reader with transparent capstan and U-shaped light conducting rod
3,365,657	01-23-68	Power Supply
3,365,665	01-23-68	Hall current measuring apparatus having a series resistor for temperature compensation
3,365,897	01-30-68	Cryogenic Thermal Insulation
3,365,930	01-30-68	Thermal shock apparatus
3,365,941	01-30-68	Precision thrust gage
3,366,886	01-30-68	Linear accelerator frequency control system
3,366,894	01-30-68	Variable duration pulse integrator
3,367,114	02-06-68	Construction and Method of Arranging a Plurality of Jet Engines
**3,367,121	02-06-68	Refrigeration device
3,367,182	02-06-68	Heat Flux System
3,367,224	02-06-68	Aligning and Positioning Device
3,367,271	02-06-68	Automatic Pump
3,367,308	02-06-68	Exposure system for animals
*3,367,445	02-06-68	Fluid Lubricant System
3,368,486	02-13-68	Single Action Separation Mechanism
3,369,222	02-13-68	Data Compressor
3,369,223	02-13-68	Incremental tape recorder and data rate converter
3,369,564	02-20-68	Transfer Valve
3,370,039	02-20-68	Process for Preparation of High-Molecular-Weight Polyaryloxysilanes
3,372,588	03-12-68	Constant temperature heat sink for calorimeters
*3,373,069	03-12-68	Method of Making an Inflatable Panel
3,373,404	03-12-68	Error-Correcting Method and Apparatus
3,373,430	03-12-68	Omnidirectional Microwave Spacecraft Antenna
3,373,431	03-12-68	Low Noise Single Aperture Multimode Monopulse Antenna Feed System
3,373,640	03-19-68	Apparatus for Machining Geometric Cones
3,373,914	03-19-68	Automatic Welding Speed Controller
3,374,339	3-19-68	Counter and Shift-Register
3,374,366	03-19-68	Complementary Regenerative Switch
**3,374,830	02-26-68	Thermal Control Panel
3,374,966	03-26-68	Control System
3,375,451	03-26-68	Adaptive Tracking Notch Filter System
3,375,479	03-26-68	Continuous Turning Slip Ring Assembly
3,376,730	04-09-68	Friction Measuring Apparatus
3,377,208	04-09-68	Thermocouple Assembly
3,377,845	04-16-68	Moment of Inertia Test Fixture
3,378,315	04-16-68	Hybrid Lubrication System and Bearing
3,378,851	04-23-68	Soft Frame Adjustable Eyeglasses
*3,378,892	04-23-68	Quick Attach Mechanism
3,379,064	04-23-68	Automatic Recording McLeod Gauge
3,379,330	04-23-68	Cryogenic Insulation System
3,379,885	04-23-68	Sight Switch Using an Infrared Source and Sensor
3,379,974	04-23-68	Particle Detection Apparatus Including a Ballistic Pendulum
3,380,042	04-23-68	Digital Telemetry System
3,380,049	04-23-68	Method of Resolving Clock Synchronization Error and Means Therefor
*3,381,339	05-07-68	Hydraulic Casting of Liquid Polymers
3,381,517	05-07-68	Rotary Bead Dropper and Selector For Testing Micrometeorite Detectors
3,381,527	05-07-68	Tension Measurement Device
3,381,569	05-17-68	Attitude Sensor For Space Vehicles
3,381,778	05-07-68	Energy Absorbing Device
**3,382,082	05-07-68	Foamed-In-Place Ceramic Refractory Insulating Material
3,382,105	05-17-68	Ion-Exchange Membrane and Electrode Assembly
3,382,107	05-17-68	Sealing Device For An Electrochemical Cell
3,382,714	05-14-68	Heat Sensing Instrument
3,383,461	05-14-68	Reduced Bandwidth Video Communication System Utilizing Sampling Technique
3,383,524	05-14-68	Solid State Pulse Generator With Constant Output Width, For Variable Input Width, In Nanosecond Range
3,383,903	05-21-68	Pressure Transducer Calibrator
3,383,922	05-21-68	Linear Differential Pressure Sensor
3,384,016	05-21-68	Lateral Displacement System For Separated Rocket Stages
3,384,075	05-21-68	Thermal Control Wall Panel
3,384,111	05-21-68	Positive Locking Check Valve
**3,384,324	05-21-68	Thermal Control Wall Panel
*3,384,820	05-21-68	Vibrating Element Electrometer With Output Signal Magnified Over Input Signal By A Function Of The Mechanical Q Of The Vibrating Element
3,384,895	05-21-68	Portable Superclean Air Column Device
3,385,036	05-28-68	Portable Superclean Air Column Device
3,386,337	06-04-68	Portable Milling Tool
**3,386,685	06-04-68	Spacecraft Airlock
3,386,686	06-04-68	Station Keeping Of A Gravity-Gradient Stabilized Satellite
3,387,149	06-04-68	Phonocardiograph Transducer
3,388,258	06-11-68	Fluid Flow Meter With Comparator Reference Means

Patent No.	Date	Title
**3,388,387	06-11-68	Drive Circuit Utilizing Two Cores
**3,388,590	06-18-68	Connector Internal Force Gauge
3,389,017	06-18-68	Sealing Member And Combination Thereof And Method Of Producing Said Sealing Member
3,389,260	06-18-68	Solar Sensor Having Coarse And Fine Sensing With Matched Preirradiated Cells and Method of Selecting Cells
3,389,346	06-18-68	Compensating Bandwidth Switching Transients In An Amplifier Circuit
3,389,877	06-25-68	Inflatable Tether
3,390,017	06-25-68	Sealed Electrochemical Cell Provided With A Flexible Casing
3,390,020	06-25-68	Semiconductor Material And Method Of Making Same
3,390,282	06-25-68	Passive Synchronized Spike Generator With High Input Impedance And Low Output Impedance And Capacitor Power Supply
**3,390,378	06-25-68	Comparator For The Comparison Of Two Binary Numbers
3,391,080	07-02-68	Metallic Film Diffusion For Boundary Lubrication
3,392,403	07-09-68	Measurement Of Time Differences Between Luminous Events
3,392,586	07-16-68	Device For Measuring Pressure
3,392,864	07-16-68	Insulation System
3,392,865	07-16-68	Filament-Wound Container
3,392,936	07-16-68	Leading Edge Curvature Based On Convective Heating
**3,393,059	07-16-68	Decontamination of Petroleum Products
3,393,330	07-16-68	Thermionic Converter With Current Augmented By Self-Induced Magnetic Field
3,393,332	07-16-68	Superconducting Alternator
3,393,380	07-16-68	Phase Locked Phase Modulator Including A Voltage Controlled Oscillator
3,393,347	07-16-68	Power Supply Circuit
3,393,384	07-16-68	Radio Frequency Coaxial High Pass Filter
3,394,359	07-23-68	Digital Memory Sense Amplifying Means
3,394,975	07-30-68	Petzval Type Objective Including Field Shaping Lens
**3,395,053	07-30-68	Thermal Control Coating
3,396,057	08-06-68	Method Of Electrolytically Binding A Layer of Semiconductors Together
3,396,184	08-06-68	Trialkyl-Dihalotantalum And Niobium Compounds
3,396,303	08-06-68	ARC Electrode Of Graphite With Ball Tip
3,396,584	08-13-68	Space Simulation And Radiative Property Testing System and Method
3,396,920	08-13-68	Apparatus For Changing The Orientation And Velocity Of A Spinning Body Traversing A Path
**3,397,094	08-13-68	Method Of Changing The Conductivity Of Vapor Deposited Gallium Arsenide By The Introduction Of Water Into The Vapor Deposition Atmosphere
*3,397,117	08-13-68	Compact Solar Still
3,397,318	08-13-68	Ablation Sensor
3,397,512	08-20-68	Vapor-Liquid Separator
3,397,932	08-20-68	Semi-Linear Ball Bearing
3,399,299	08-27-68	Apparatus For Phase Stability Determination
3,399,574	09-03-68	Method For Leakage Testing of Tanks
3,404,348	10-01-68	Low Level Signal Limiter
3,405,406	10-15-68	Hard Space Suit
3,405,887	10-15-68	Ring Wing Tension Vehicle
3,406,336	10-15-68	RC Rate Generator For Slow Speed Measurement
*3,406,742	10-22-68	Automatic Fatigue Test Temperature Programmer
3,407,304	10-22-68	Micrometeoroid Penetration Measuring Device
3,408,816	11-05-68	Rocket Engine Injector
3,408,861	11-05-68	Rocket Engine Thrust Vector Deviation Measurement Device
3,408,870	11-05-68	Zero Gravity Apparatus
3,409,247	11-05-68	Solid State Thermal Control Polymer Coating
3,409,252	11-05-68	Controllers
3,409,554	11-05-68	Gd or Sm Doped Silicon Semi-Conductor Composition
3,409,730	11-05-68	Thermal Radiation Shielding
*3,411,356	11-19-68	Zeta Potential Flow Meter
3,412,559	11-26-68	Ion Engine Casing Construction And Method of Making Same
3,412,598	11-26-68	Impact Testing Machine
*3,412,729	11-26-68	Method And Apparatus For Continuously Monitoring Blood Oxygenation, Blood Pressure, Pulse Rate and The Pressure Pulse Curve Utilizing An Ear Oximeter As Transducer
3,412,961	11-26-68	Means For Suppressing Or Attenuating Bending Motion Of Elastic Bodies
*3,413,115	11-26-68	Brazing Alloy
3,413,510	11-26-68	Electronic Cathode Having A Brush-Like Structure And A Relatively Thick Oxide Emissive Coating
3,413,536	11-26-68	Automatic Battery Charger
3,414,012	12-03-68	Dual Latching Solenoid Valve
3,414,358	12-03-68	Optical Monitor Panel
3,415,032	12-10-68	Evacuation Port Seal
3,415,069	12-10-68	High Pressure Helium Purifier
3,415,116	12-10-68	Floating Two-Force-Component Measuring Device
3,415,126	12-10-68	Azimuth Laying System
3,415,156	12-10-68	Controlled Release Device
*3,415,556	12-10-68	Ceramic-To-Metal Seal And Method Of Making Same
3,415,643	12-10-68	High Temperature Ferromagnetic Cobalt-Base
3,415,992	12-10-68	Extended Area Semiconductor Radiation Detectors And A Novel Readout Arrangement
3,416,106	12-10-68	Broadband Microwave Waveguide Window
3,416,274	12-17-68	Flexibly Connected Support And Skin
**3,416,939	12-17-68	Alkali-Metal Silicate Protective Coating
3,416,975	12-17-68	Etching Of Aluminum For Bonding
3,416,988	12-17-68	Traveling Sealer For Contoured Table
3,417,247	12-17-68	Radiant Energy Intensity Measurement System
3,417,266	12-17-68	Pulse Modulator Providing Fast Rise And Fall Times
3,417,298	12-17-68	Polarity Sensitive Circuit
3,417,316	12-17-68	Sidereal Frequency Generator
3,417,321	12-17-68	Increasing Efficiency Switching-Type Regulator Circuits
3,417,332	12-17-68	Frequency Shift Keying Apparatus
3,417,399	12-17-68	Millimeter-Wave Radiometer For Radio-Astronomy
3,417,400	12-17-68	Triaxial Antenna
*3,419,329	12-31-68	Combined Optical Attitude And Altitude Indicating Instrument
3,419,363	12-31-68	Self-Lubricating Fluoride-Metal Composite Materials
3,419,433	12-31-68	Solar Cell And Circuit Array And Process For Nullifying Magnetic Fields
**3,419,537	12-31-68	Dicyanoacetylene Polymers
*3,419,827	12-31-68	Indexing Microwave Switch
3,419,964	01-07-69	Apparatus For Measuring Swelling Characteristics of Membranes
3,420,069	01-07-69	Condenser-Separator

Patent No.	Date	Title
*3,420,223	01-07-69	Electrode For Biological Recording
3,420,225	01-07-69	Balanced Bellows Spirometer
3,420,338	01-07-69	Hermetic Sealed Vibration Damper
3,420,704	01-07-69	Depositing Semiconductor Films Utilizing A Thermal Gradient
3,420,945	01-07-69	Electrode and Insulator With Shielded Dielectric Junction
**3,420,978	01-07-69	Pretreatment Method For Anti-Wettable Materials
3,421,004	01-07-69	Solar Optical Telescope Dome Control System
3,421,053	01-07-69	Tumbler System To Provide Random Motion
3,421,056	01-07-69	Thin Window Drifted Silicon, Charged Particle Detector
3,421,105	01-07-69	Automatic Acquisition System For Phase-Lock Loop
*3,421,134	01-07-69	Electrical Connector
3,421,363	01-14-69	Harness For Vertically Supporting Slender Bodies For Vibration Testing
3,421,506	01-14-69	Relief Container
3,421,541	01-14-69	Relief Valve
3,421,549	01-14-69	Pneumatic System For Controlling And Actuating Pneumatic Cyclic Devices
*3,421,591	01-14-69	Rock Drill For Recovering Samples
3,421,700	01-14-69	Electromechanical Actuator
3,421,768	01-14-69	Foil Seal
**3,421,864	01-14-69	Multilayer Porous Ionizer
**3,421,948	01-14-69	Method Of Making Membranes
3,422,019	01-14-69	Method For Processing Ferrite Cores
3,422,213	01-14-69	Connector Strips
3,422,278	01-14-69	Signal Generator
**3,422,291	01-14-69	Magnetohydrodynamic Induction Machine
*3,422,324	01-14-69	Pressure Variable Capacitor
3,422,352	01-14-69	Apparatus For Measuring Current Flow
**3,422,354	01-14-69	Test Fixture For Pellet-Like Electrical Elements
3,422,390	01-14-69	Coupling Device
3,422,403	01-14-69	Data Compression System
3,422,440	01-14-69	Plural Recorder System
3,423,179	01-21-69	Catalyst For Growth Of Boron Carbide Crystal Whiskers
3,423,290	01-21-69	Lyophilized Reaction Mixtures
*3,423,579	01-21-69	Electronic Divider And Multiplier Using Photocells
3,423,608	01-21-69	Nonmagnetic Thermal Motor For A Magnetometer
3,424,966	01-28-69	Synchronous Servo Loop Control System
3,425,131	02-04-69	Extensometer
3,425,486	02-04-69	Garments For Controlling The Temperature Of The Body
3,425,487	02-04-69	Space Suit Heat Exchanger
*3,426,230	02-04-69	Direct Radiation Cooling Of The Collector Of Linear Beam Tubes
**3,426,263	02-04-69	Method And Apparatus For Battery Charge Control
**3,426,272	02-04-69	Device For Determining The Accuracy Of The Flare On A Flared Tube
3,426,746	02-11-69	Method And Apparatus For Attaching Physiological Monitoring Electrodes
3,427,089	02-11-69	Ultraviolet Filter
3,427,097	02-11-69	Pneumatic Mirror Support System
3,427,205	02-11-69	Spacecraft Battery Seals
3,427,525	02-11-69	Regulated D.C. to D.C. Converter
3,428,761	02-18-69	Excitation And Detection Circuitry For A Flux Responsive Magnetic Head
3,428,812	02-18-69	Optical Spin Compensator
3,428,910	02-18-69	Automatic Gain Control System
3,428,919	02-18-69	Signal Multiplexer
3,428,923	02-18-69	Broadband Choke For Antenna Structure
3,429,477	02-25-69	Apparatus for Ejection Of An Instrument Cover
3,429,529	02-25-69	Control Devices For Flexible Wing Aircraft
3,430,115	02-25-69	Apparatus For Ballasting High Frequency Transistors
3,430,182	02-25-69	Electrical Feed-Through Connection For Printed Circuit Boards And Printed Cables
3,430,237	02-25-69	Time Division Multiplex System
3,430,909	03-04-69	Device For Handling Heavy Loads
3,432,730	03-11-69	Semiconductor P-N Junction Stress And Strain Sensor
3,433,015	03-18-69	Gas Turbine Combustion Apparatus
*3,433,953	03-18-69	Compensating Radiometer
3,433,960	03-18-69	Retrodirective Optical System
3,433,961	03-18-69	Scanning Aspect Sensor Employing An Apertured Disc And A Commutator
3,434,037	03-18-69	Multiple Varactor Frequency Doubler
3,434,050	03-18-69	High Impedance Measuring Apparatus
3,434,064	03-18-69	Amplifier Drift Tester
3,434,885	03-25-69	Method Of Making Electrical Contact On Silicon Solar Cell And Resultant Product
3,435,246	03-25-69	Light Radiation Direction Indicator With A Baffle Of Two Parallel Grids
3,437,527	04-08-69	Method For Producing A Solar Cell Having An Integral Protective Covering
3,437,560	04-08-69	Use Of The Enzyme Hexokinase For The Reduction Of Inherent Light Levels
3,437,832	04-08-69	Ring Counter
3,437,874	04-08-69	Display For Binary Characters
3,437,903	04-08-69	Protection For Energy Conversion Systems
3,437,919	04-08-69	Cryogenic Apparatus For Measuring The Intensity Of Magnetic Fields
3,437,935	04-08-69	Varactor High Level Mixer
3,437,959	04-08-69	Helical Coaxial Resonator RF Filter
3,438,044	04-08-69	Monopulse System With An Electronic Scanner
3,438,263	04-15-69	Fluid Sample Collector
3,439,886	04-22-69	Visual Target For Retrofire Attitude Control
3,443,208	05-06-69	Optically Pumped Resonance Magnetometer For Determining Vectroral Components In A Spatial Coordinate System
3,444,380	05-13-69	Electronic Background Suppression Method And Apparatus For A Field Scanning Sensor
3,446,387	05-27-69	Piping Arrangement Through A Double Wall Chamber
3,446,676	05-27-69	Solar Battery With Interconnecting Means For Plural Cells
3,446,960	05-27-69	Device For Measuring Electron-Beam Intensities And For Subjecting Materials To Electron Irradiation In An Electron Microscrope
3,446,992	05-27-69	Bus Voltage Compensation Circuit For Controlling Direct Current Motor
3,446,998	05-27-69	Bimetallic Power Controlled Actuator
3,447,015	05-27-69	Ion Thruster Cathode
3,447,071	05-27-69	Probes Having Guard Ring and Primary Sensor At Same Potential To Prevent Collection Of Stray Wall Currents In Ionized Gases
3,447,154	05-27-69	Cooperative Doppler Radar System
3,447,155	05-27-69	Ranging System
3,447,233	06-03-69	Bonding Thermoelectric Elements To Nonmagnetic Refractory Metal Electrodes
3,477,774	06-03-69	High Pressure Air Valve
3,448,346	06-03-69	Extensible Cable Support
3,448,273	06-03-69	Plurality of Photosensitive Cells On A Pyramidical Base For Planetary Trackers
3,448,290	06-03-69	Variable-Width Pulse Integrator
3,448,341	06-03-69	Electrical Load Protection Device

Patent No.	Date	Title
3,447,850	06-03-69	Sealed Cabinetry
3,450,878	06-17-69	Dosimeter For High Levels of Absorbed Radiation
3,450,842	06-17-69	Doppler Frequency Spread Correction Device For Multiplex Transmissions
3,450,946	06-17-69	Protective Circuit of the Spark Gap Type
3,452,976	07-01-69	Printed Circuit Soldering Aid
3,452,872	07-01-69	Shock-Layer Radiation Measurement
3,453,172	07-01-69	Bonding Graphite With Fused Silver Chloride
3,452,423	07-01-69	Segmenting Lead Telluride-Silicon Germanium Thermoelements
3,458,313	07-29-69	High Resolution Developing of Photo-sensitive Resists
3,458,833	07-29-69	Frequency Control Network For a Current Feedback Oscillator
3,458,104	07-29-69	Weld Control System Using Thermocouple Wire
3,458,162	07-29-69	Control Devices for Flexible Wing Aircraft
3,456,112	07-15-69	Temperature Sensitive Capacitor Device
3,456,193	07-15-69	Phase Quadrature-Plural Channel Data Transmission System
3,458,702	07-29-69	Telespectrograph
3,458,651	07-29-69	Television Simulation For Aircraft and Space Flight
3,458,726	07-29-69	Power Control Circuit
3,453,462	07-01-69	Slug Flow Magnetohydrodynamic Generator
3,453,546	07-01-69	Telemeter Adaptable for Implanting In An Animal
**3,454,410	07-08-69	Alkali-Metal Silicate Protective Coating
3,455,171	07-15-69	Inertial Reference Apparatus
3,456,201	07-15-69	System For Monitoring Signal Amplitude Ranges
3,458,851	07-29-69	Electrical Connector Pin With Wiping Action
3,458,217	07-29-69	Tubular Coupling Having Low Profile Band Segments With Means for Preventing Relative Rotation
3,455,121	07-15-69	Water Separating System
*3,459,391	08-05-69	Interconnection of Solar Cells
3,460,995	08-12-69	Method and Device for Determining Battery State of Charge
3,460,381	08-12-69	Balance Torquemeter
3,460,781	08-12-69	Tape Recorder
3,460,784	08-12-69	Control Devices for Flexible Wing Aircraft
3,460,378	08-12-69	Strain Gauge Measuring Techniques
3,460,759	08-12-69	Combustion Chamber
3,460,379	08-12-69	Tensile Strength Testing Device
3,461,437	08-12-69	Digital Memory In Which the Driving Of Each Word Location Is Controlled By A Switch Core
3,460,397	08-12-69	Mechanical Actuator
3,461,393	08-12-69	Cascaded Complementary Pair Broad-band Transistor Amplifiers
3,461,290	08-12-69	Conically Shaped Cavity Radiometer With a Dual Purpose Cone Winding
3,461,721	08-19-69	Flow Field Simulation
3,461,855	08-19-69	Conditioning Suit
3,463,563	08-26-69	Swivel Support For Gas Bearings
3,464,049	08-26-69	Load Cell Protection Device
3,463,939	08-26-69	Pulsed Differential Comparator Circuit
3,464,051	08-26-69	Electrical Spot Terminal Assembly
3,464,012	08-26-69	Automatic Signal Range Selector For Metering Devices
3,463,001	08-26-69	Thrust Dynamometer
3,464,016	08-26-69	Demodulation System
3,463,673	08-26-69	Electrochemical Coulometer and Method of Forming
3,464,018	08-26-69	Digitally Controlled Frequency Synthesizer
3,464,652	09-02-69	Control Devices For Flexible Wing Aircraft
3,466,243	09-09-69	Alloys for Bearings
3,465,482	09-09-69	Spacecraft Radiator Cover
3,466,198	09-09-69	Solar Cell Matrix
3,466,085	09-09-69	Articulated Multiple Couch Assembly
3,466,459	09-09-69	Current Steering Switch
3,466,570	09-09-69	Inverter With Means For Base Current Shaping For Sweeping Charge Carriers From Base Region
3,465,986	09-09-69	Satellite Despin Device
3,466,484	09-09-69	Ionization-Vacuum Gauge With All But The End of the Ion-collector Shielded
3,466,424	09-09-69	Evaporant Source for Vapor Deposition
3,466,052	09-09-69	Foil Seal
3,465,567	09-09-69	Method of Making Tubes
3,465,569	09-09-69	Low Temperature Flexure Fatigue Cryostat
3,465,747	09-09-69	Ballistocardiograph
3,466,418	09-09-69	Determination of Spot Weld Quality
3,466,560	09-09-69	Stable Amplifier Having A Stable Quiescent Point

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